Feasibility Study/ Remedial Action Plan

Former Pechiney Cast Plate, Inc., Facility

3200 Fruitland Avenue, Vernon, California

Prepared for:

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Geomatrix

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This report was prepared by the staff of Geomatrix Consultants, Inc., under the supervision of the Engineer and/or Geologist whose signature appears hereon.

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Geomatrix

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ACRONYMS AND ABBREVIATIONS

AF	Attenuation Factor
Alcoa	Aluminum Company of America
AQMD	Air Quality Management District
ARAR	Applicable or Relevant and Appropriate Requirement
BTEX	Benzene, Toluene, Ethylbenzene, and Total Xylenes
bgs	below ground surface
Cal-EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
CHHSL	California Human Health Screening Level
COC	Chemical of Concern (including metals)
cfu/gm-dw	bacteria colony forming units per gram of soil dry weight
COPC	Chemical of Potential Concern (including metals)
Cr (VI)	Hexavalent Chromium
DAF20	Dilution Attenuation Factor of 20
DCA	Dichloroethane
DPH	Department of Public Health
DTSC	Department of Toxic Substances Control
DWR	Department of Water Resources
EDR	Environmental Data Resource
ESA	Environmental Site Assessment
FS	Feasibility Study
Geomatrix	Geomatrix Consultants, Inc.
GRA	General Response Actions
H&EC	City of Vernon Health & Environmental Control
HASP	Health and Safety Plan

HHRA	Human Health Risk Assessment
HI	Hazard Index
HPWD	City of Huntington Park Water Department
HQ	Hazard Quotient
LR	Liquid Ring
MCL	Maximum Containment Level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
NCP	National Contingency Plan
O&M	Operation and Maintenance
OEC	Other Environmental Condition
OEHHA	Office of Environmental Health Hazard Assessment
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethene
Pechiney	Pechiney Cast Plate, Inc.
PID	Photoionization Detector
PPE	Personal Protective Equipment
PRG	Preliminary Remediation Goal
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAP	Remedial Action Plan
RBSL	Risk-Based Screening Level
REC	Recognized Environmental Condition
RI/FS	Remedial Investigation/Feasibility Study
RWQCB	California Regional Water Quality Control Board, Los Angeles Region
SCM	Site Conceptual Model
Site	Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California

SSL	Soil Screening Level
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compound
SWPPP	Storm Water Pollution Prevention Plan
TBC	to-be-considered
TCE	Trichloroethene
TPH	Total Petroleum Hydrocarbons
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
Vernon facility	Former Pechiney Cast Plate, Inc. Facility, 3200 Fruitland Avenue, Vernon, California
vGAC	vapor-phase Granular Activated Carbon
VOC	Volatile Organic Compound
VWD	City of Vernon Water Department

FEASIBILITY STUDY/ REMEDIAL ACTION PLAN

Former Pechiney Cast Plate, Inc., Facility
3200 Fruitland Avenue
Vernon, California

1.0 INTRODUCTION

Geomatrix Consultants, Inc. (Geomatrix), has prepared this Feasibility Study (FS) and Remedial Action Plan (RAP) on behalf of Pechiney Cast Plate, Inc. (Pechiney), for the former Pechiney facility (Vernon Facility or Site) located at 3200 Fruitland Avenue in Vernon, California (Figure 1). This FS evaluates potentially applicable remedial technologies and provides recommendations for the proposed, preferred remedy for impacted soil and soil vapor within the vadose zone, and impacted concrete at the Site using the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) guidance (U.S. EPA, 1988). The FS does not address Stoddard solvent-impacted soil associated with Building 112A and associated former underground storage tanks (USTs). In March 2008, the Los Angeles Regional Water Quality Control Board (RWQCB) directed Aluminum Company of America (Alcoa) to further characterize the Stoddard solvent-impacted soils as the former Site operator during the time of the Stoddard solvent release(s) (RWQCB, 2008). An evaluation of a groundwater remedy is not required because of the lack of a complete exposure pathway with respect to groundwater directly beneath the Site, and therefore it is not included in this document. However, an evaluation of the potential for continued or future impacts to groundwater quality from soil impacts in the vadose zone is addressed in this FS/RAP.

Based on the proposed preferred remedies discussed in this FS, a RAP is included in this document to address chemicals of concern (COCs; including metals) in the vadose zone that exceed risk-based screening levels (RBSLs) and background concentrations for metals. Proposed implementation details for the proposed preferred alternatives are discussed in the RAP. Subject to the approval of the FS, the RAP is to be implemented 1) upon approval of the City of Vernon Health and Environmental Control (H&EC; also referred to as the City of Vernon Environmental Health Department) pursuant to its existing orders/directives and 2) upon receipt of a directive/order from any other necessary public agency. The RAP will address soil and soil vapor impacted with volatile organic compounds (VOCs); soil impacted with metals (specifically arsenic), and polychlorinated biphenyls (PCBs); and the demolition and disposal of concrete impacted with PCBs. Not addressed in the RAP are soil impacts related to the Stoddard solvent and associated compounds that were found in soil, as these impacts are to be further characterized by Alcoa under the jurisdiction of the RWQCB. Remedial alternatives similar to those proposed in this FS would be applied to any shallow impacted soil or concrete discovered during the below-grade demolition work.

This FS/RAP has been completed using 40 Code of Federal Regulations (CFR) 300, also known as the National Contingency Plan (NCP), and appropriate guidance documents developed by the United States Environmental Protection Agency (U.S. EPA). Under the NCP 40 CFR 300.430(d)(1), potential future exposure scenarios are used to develop site-specific risk-based remediation goals. For this Site, several exposure scenarios were evaluated, including exposures related to future construction activities and future commercial/industrial Site use.

This FS/RAP includes the following information (listed by relevant section).

- Section 2 provides a Site description and history along with the geologic and hydrologic settings.
- Section 3 summarizes the scope and findings of previous remedial investigations and discusses the nature and extent of known impacted areas.
- Section 4 presents the Site conceptual model (SCM) and the results of a human health screening risk assessment.
- Section 5 introduces the remedial action objectives (RAOs) for the Site; proposed remediation goals; summarizes areas of known impacts; and presents the general response actions (GRAs), that when implemented, will meet the RAOs for the Site.
- Section 6 discusses the screening criteria and evaluation process used for selection of potential remedial alternatives.
- Section 7 provides a detailed evaluation of the remedial options selected during the screening process.
- Section 8 presents the proposed preferred remedial alternatives for the Site.
- Section 9 includes the RAP and discusses the proposed implementation of the proposed preferred remedial alternatives.
- Section 10 discusses the community involvement process.
- Section 11 provides a list of applicable references used to prepare the FS/RAP.

2.0 BACKGROUND

This section summarizes the Site description and history and the Site geologic and hydrogeologic setting.

2.1 SITE DESCRIPTION AND HISTORY

The Site was once part of a 56-acre aluminum manufacturing facility operated by Alcoa. The historical and current Site plans of the former Alcoa facility are shown on Figures 2 and 3, respectively.

Alcoa's operations at the Site reportedly began in approximately 1937. Previous manufacturing at the Site included production of high-precision cast aluminum plates. As part of their manufacturing operations Alcoa used fuels and Stoddard solvent, both of which were stored in USTs. Alcoa also operated processes that required lubricating oils and generated hazardous waste that was stored at various locations throughout the Site. In approximately 1997, Alcoa sold the eastern half of its facility, which subsequently was razed, subdivided, and redeveloped for industrial and commercial uses. In December 1998, Alcoa sold the western portion of the facility (3200 Fruitland Avenue) to Century Aluminum Company. In 1999, Pechiney purchased the Site. Alcoa investigated subsurface conditions and conducted limited remediation in both the eastern and western portions of its facility at that time as part of the closure of its City of Vernon H&EC hazardous materials permit.

The Site is comprised of approximately 26.9 acres (including Assessor Parcel Numbers 6301-008-010, -011, -012, -013, which was divided into Parcels 6, 7, and 8) and was formerly occupied by approximately 600,000 square feet of building area. The Site was used to manufacture high-precision cast aluminum plates. As part of the aboveground demolition work completed in November 2006 at the Site, the above-ground features, including the former manufacturing facilities, were demolished, and the debris was transported off-site for disposal or recycling. The procedures for the remaining demolition work related to the removal of building slabs, pavements, and below-grade man-made structures (including footings, foundation, pits, and sumps) and other structures located adjacent to the former building areas are described in the Below Grade Demolition Plan (Geomatrix, 2006b). This FS/RAP provides the details and procedures for remediating impacted concrete slabs and soils during below-grade demolition and soil vapor during and following below-grade demolition.

2.2 LAND USE

The Site is zoned for industrial use. The City of Vernon is in the process of purchasing the property. The future Site use will remain industrial or commercial, with the north portion of the Site anticipated for use as a power plant. The California Energy Commission permit approval for the power plant is pending and the timing of that approval may occur in 2009. The proposed footprint of the plant is shown on Figure 4.

2.3 GEOLOGIC AND HYDROGEOLOGIC SETTING

The physical setting of the Site, including Site topography, surface water, geology, and hydrogeology, is discussed in the following subsections.

2.3.1 Topography and Surface Water

Topography in the Site vicinity is shown on the United States Geological Survey (USGS) South Gate, California 7.5-minute series Topographic Quadrangle Map (1964, photorevised 1981). The Site is located in Township 2 South, Range 13 West, Section 14, San Bernardino Base & Meridian at approximately 180 feet above mean sea level. The local topographic gradient is gentle, sloping toward the south at approximately 25 feet per mile. The Los Angeles River, the surface water body nearest to the Vernon Facility, is located approximately 4000 feet north-northeast of the Site.

2.3.2 Geology and Hydrogeology

Information presented in this section is based on the State of California Department of Water Resources (DWR) Bulletin 104 (DWR, 1961), or as referenced below.

2.3.2.1 Geology

Sediments underlying the Site and its vicinity are associated with Recent Alluvium, the Lakewood Formation, and the underlying San Pedro Formation. Based on basin-scale interpretations presented in DWR (1961), Recent Alluvium extends from ground surface to a depth of approximately 100 feet and consists primarily of stream-deposited gravel, sand, silt, and clay with some interbedded marine deposits. The Recent Alluvium is underlain by approximately 150 to 200 feet of the Upper Pleistocene Lakewood Formation, which consists of alternating sequences of fine- and coarse-grained alluvial sediments. The Lakewood Formation is underlain by the Lower Pleistocene San Pedro Formation which consists of approximately 900 to 1200 feet of sand and gravel, interbedded with clays of marine origin.

Based on the documents reviewed by Geomatrix, previous investigations conducted at the former Alcoa facility (including the portion of the facility that comprise the Site) suggest the Site is underlain by fine-grained (predominantly silt) and coarse-grained (predominantly sand) sediments (referred to by others as Recent Alluvium) from ground surface to approximately 40 feet below ground surface (bgs) (Geraghty & Miller, 1991). Sediments below 40 feet are predominantly silt and clay (referred to by others as the Bellflower aquitard) from approximately 40 to 85 feet bgs, and predominantly sand (referred to by others as the Lakewood Formation) to a depth of at least 161.5 feet, the total depth of the deepest soil boring drilled at the Site (Geraghty & Miller, 1991). Although observed at different depths, similar lithology was encountered by Geomatrix during recent investigations. Cross-sections depicting the lithology at the Site are shown on Figures 5 and 6.

2.3.2.2 Hydrogeology

The Site is located within the Los Angeles Forebay Area of the Central Basin of the Los Angeles County Coastal Plain. The Central Basin is bounded on the northwest by the Santa Monica Mountains; on the north and northeast by the Repetto, Merced, and Puente Hills; on the east by Coyote Creek (the approximate Orange County/Los Angeles County line); and on the south and west by the Pacific Ocean. The Central Basin is largely composed of alluvial sediments shed from the surrounding hills and mountains (DWR, 1961).

Aquifers between ground surface and a depth of approximately 700 feet bgs at the Site include the Exposition, Gage, Hollydale, Jefferson, and Lynwood aquifers. The Exposition and Gage aquifers are part of the Lakewood Formation, while the Hollydale, Jefferson, and Lynwood aquifers are part of the underlying San Pedro formation. Below the Lynwood aquifer are the Silverado and Sunnyside aquifers of the San Pedro formation. These aquifers have variable thicknesses and are separated by undifferentiated finer-grained sediments. Perched groundwater may be associated with the Bellflower aquitard in the Recent Alluvium (DWR, 1961).

Historical boring logs indicate shallowest groundwater beneath the Site was encountered within a sand unit, interpreted to be the Exposition aquifer within the Lakewood Formation, between depths of 145 and 150 feet bgs (Geraghty & Miller, 1991 and 1995). Groundwater was encountered at 150 feet in soil borings advanced in the northern portion of the Site (Geomatrix, 2006a and 2006d). Boring logs reviewed by Geomatrix did not indicate the presence of perched groundwater above and within sediments interpreted as the Bellflower aquitard. Perched groundwater was not observed during Geomatrix's site investigations (Geomatrix, 2006a and 2006d). According to information provided by the City of Vernon H&EC, groundwater is produced off-site from the Jefferson, Lynwood, Silverado, and Sunnyside aquifers from depths of approximately 450 to 1400 feet bgs (based on wells No. 15 and 19; Geoscience, 2005).

Information regarding water supply wells in the vicinity of the Site is presented in the Phase I Environmental Site Assessment (ESA) report (Geomatrix, 2005a). In summary, fifteen municipal water supply wells, nine USGS monitoring wells, and one well listed by the Environmental Data Resource (EDR) Aquiflow Database were identified within a 1-mile radius of the Site (EDR, 2005). Seven wells belong to the City of Vernon Water Department (VWD) and four wells belong to the City of Huntington Park Water Department (HPWD). The remaining ten wells did not have ownership listed in the EDR report.

Of the fifteen designated municipal wells, two VWD municipal well clusters are located within a one-mile radius of the Site and consist of six active wells (VWD well numbers 11, 12, 15, 16, 17, and 19); two inactive wells (VWD well numbers 5 and 7); and three destroyed wells (VWD well numbers 9, 10, and 13). In addition, one well cluster is located approximately ½-mile northwest of the Site and the other well cluster is located approximately ⅓-mile northeast of the Site.

HPWD municipal wells located within a 1-mile radius of the Site consist of two active wells (HPWD well numbers 14 and 17); one inactive well (HPWD well number 9); and one destroyed well (HPWD well number 11). One active well is located approximately ½-mile southwest of the Site, and the other active well is located approximately one mile southeast of the Site.

In preparation of Alcoa's environmental closure of its facility, nine groundwater monitoring wells were installed by Alcoa between 1990 and 1991 under the oversight of the City of Vernon H&EC. Six of these monitoring wells AOW-1, AOW-3, AOW-6, AOW-7, AOW-8, and AOW-9 were located on the Site and the other three wells were located on the eastern portion of the Alcoa facility that was previously sold and redeveloped (Figure 3). According to documents reviewed (A.J. Ursic, Jr., 1999a, Enviro-Wise, 1998, and Alcoa, 1997) all but three of these monitoring wells (AOW-6, AOW-8, and AOW-9) have been destroyed by Alcoa under the oversight of the City of Vernon H&EC. The three remaining groundwater monitoring wells are located near former Building 112A in the southern portion of Parcel 7. Groundwater monitoring conducted between 1990 and 1997 indicates the depth to groundwater beneath the Site during that time ranged from approximately 135 to 158 feet bgs (Enviro-Wise, 1998). Recently reported groundwater depth measurements ranged from 136.24 to 140.40 feet below top of well casing in wells AOW-6 and AOW-8, respectively (URS Corporation, 2006). Groundwater flow direction was reported as west-northwesterly (Geraghty & Miller, 1991 and 1995; Enviro-Wise, 1998). Regional groundwater flow in the vicinity of Vernon is to the west as depicted on a fall 2001 groundwater elevation contour map (Water Replenishment District of Southern California, website located at http://www.wrd.org).

3.0 SITE CHARACTERIZATION

This section discusses investigations and assessments, including previous remediation activities, conducted at the Site. Sampling data collected from previous investigations conducted at the Site are summarized in Appendix A, and sample locations are shown on Figure 7.

3.1 ALCOA'S PREVIOUS INVESTIGATIONS AND ASSESSMENTS

Previous assessments were conducted by consultants to Alcoa and were related to closure of Alcoa's facilities and operations on and east of the Site (including Alcoa's closure of its City of Vernon H&EC hazardous materials permit). These assessments were conducted under the oversight of the City of Vernon H&EC. Previous assessment activities included the collection and analysis of soil, groundwater, soil vapor, and building materials samples. A summary of previous Alcoa investigations is presented in the Phase I ESA (Geomatrix, 2005). During these investigations, soil impacted with petroleum hydrocarbons (including Stoddard solvent), metals, PCBs, and VOCs were identified. The presence of chlorinated VOCs was also identified in groundwater at a depth of approximately 150 feet bgs within the southwestern portion of Parcel 7, west of Building 112A. In addition, limited soil remediation was conducted in discrete areas of the Site by Alcoa. In 1999, the City of Vernon H&EC issued a letter approving these remedial actions with specific provisions that include the following.

- Stoddard solvent impacts to soil would be addressed by Alcoa.
- Future review and determinations may be necessary if subsequent information, which significantly affects any decision, is found regarding the Site.

In a subsequent letter dated July 18, 2006, the City of Vernon H&EC required that Alcoa provide a plan by August 30, 2006 for active remediation of the Stoddard solvent-impacted soil (City of Vernon, 2006). The requirements for active remediation were based on the fact that the most recent soil data indicated that Stoddard solvent concentrations exceeded cleanup standards and that the overlying buildings and foundations which limited the physical removal of the impacted soil would be removed. Based on recent discussions with the City of Vernon H&EC, Geomatrix understands that Alcoa has not submitted the requested plan. However, as further discussed in this section, the Los Angeles RWQCB has directed Alcoa to take further steps to address the Stoddard solvent impacts.

As part of Alcoa's preparation for closure of its facilities, groundwater wells were installed at the Site in 1990 by Alcoa under the oversight of the City of Vernon H&EC as discussed in Section 2.3.2.2. No groundwater monitoring wells were installed in the northwest portion of the Site. The locations of the monitoring wells are shown on Figure 3. Groundwater quality data collected from monitoring wells sampled and analyzed between 1990 and 1997 indicated the presence of trichloroethene (TCE); 1,2-dichloroethane (1,2-DCA); and chloroform in the Exposition aquifer in groundwater beneath the southwest portion of the Site with historical concentrations of 160 micrograms per liter (µg/L), 370 µg/L, and 105 µg/L, respectively, of TCE, 1,2-DCA and chloroform (Enviro-Wise, 1998). The highest concentrations of these VOCs were detected in groundwater in the vicinity of the former Stoddard solvent USTs located outside of Building 112A in Parcel 7.

Previous evaluations conducted by Alcoa suggested the source of VOCs in groundwater in the southwest portion of Parcel 7 was from an upgradient, off-site source. At the time, the City of Vernon H&EC concurred with this evaluation, but because the closure of the groundwater wells would require the Los Angeles RWQCB concurrence and approval, Alcoa submitted its recommendations for Site closure to the RWQCB on February 18, 1999 (Alcoa, 1999). Because groundwater at these wells was impacted with chlorinated VOCs and because the wells were located in an area associated with the former Stoddard solvent USTs, the RWQCB required that Alcoa perform additional testing of groundwater for methyl tertiary-butyl ether and fuel oxygenates (RWQCB, 2002). Alcoa conducted additional monitoring of the remaining three groundwater wells in 2005 and 2006 and has recently submitted the monitoring data to the RWQCB. Based on these monitoring results, the concentration of chlorinated VOCs decreased relative to the concentrations reported earlier (1990-1997). The compounds TCE, 1,2-DCA, and chloroform were detected at concentrations up to 28 μg/L, 6.1 μg/L, and 8.6 μg/L, respectively during the most recent sampling event in 2006. These compounds were not detected in groundwater samples from well AOW-6.

In a March 28, 2008 letter, the RWQCB directed Alcoa to 1) provide a work plan to characterize residual soil contamination in the former Stoddard solvent UST area and submit a site-specific health and safety plan by April 25, 2008; 2) sample the groundwater wells in the former UST area (AOW-7, AOW-8 and AOW-9) or install and sample replacement groundwater wells if AOW-7, AOW-8 and AOW-9 can not be used or located; 3) submit additional historical reports and data related to the Stoddard solvent releases; 4) analyze soil and groundwater for a specific suite of petroleum hydrocarbon compounds and VOCs; 5) log and sample soil at 5-foot intervals, at lithologic changes, or observed impacted soil; and 6) initiate electronic submittals through the State database (RWQCB, 2008).

3.2 ALCOA'S PREVIOUS REMEDIATION ACTIVITIES

Consultants to Alcoa have previously conducted remediation activities in specific areas of the Site under the direction of the City of Vernon H&EC. These remediation activities are briefly described below and the locations are shown on Figure 7.

- July to October 1992 – excavation of diesel-impacted soil in conjunction with removal of three 10,000-gallon diesel USTs and a pump vault located south of electrical substation #2. The excavations were backfilled with clean engineered fill, compacted, and capped with concrete (OHM Remediation Services Corporation [OHM], 1992).

- January 1995 – removal of four 10,000-gallon Stoddard solvent USTs located west of Building 112A. The maximum excavation depth was 18 feet bgs. The area was backfilled with Stoddard solvent-impacted soil from 3 to 18 feet bgs. At that time, the City of Vernon H&EC "agreed that Alcoa could place the contaminated soil back into the excavation, provided that Alcoa would remediate the Site within a reasonable time frame" (CCG Group, Inc., 1995). A 6-mil plastic liner was placed over the Stoddard solvent-impacted soil, and clean soil was backfilled over the liner from 3 feet bgs to grade. The area was then capped with concrete.

Following the removal of the Stoddard solvent tanks and delivery system in January 1995, Alcoa conducted a soil investigation to determine the extent of the Stoddard solvent contamination (Morrison Knudsen Corporation, 1995). A total of five soil investigations were performed by Alcoa between 1995 and 2005 (Environmental Protection and Compliance, 2006), and these investigations are described below.

- August to November 1995 – Alcoa completed laboratory bench-scale treatability testing on Stoddard solvent-impacted soils obtained from the subsurface in the vicinity of former solvent handling and storage areas within Building 112A. The testing was conducted to determine the applicability of in situ bioremediation of vadose zone soils. The treatability testing included the use bioslurry reactor vessels and soil column reactors (Alcoa Technical Center, 1996a.)

- Analytical testing indicated that appropriate environmental conditions (including pH, naturally occurring nutrients, indigenous microbial populations, and soil moisture) existed to depths of 45 feet bgs that would be supportive of in situ biodegradation of Stoddard solvent contaminated soil. The primary findings associated with the bioslurry reactor testing indicated that under optimal test conditions, 50 percent of the hydrocarbons were degraded within four weeks under aerobic conditions within the reactor, and that less than 5 percent of the hydrocarbons were lost due to volatilization. The primary findings from column reactor studies further supported the fact that Stoddard solvent contaminated soils were amenable to biodegradation as hydrocarbon concentrations were reduced by 93 to 95 percent using a combination of biodegradation (80 percent) and volatilization (13 to 14 percent). Furthermore, significantly high levels of heterotrophic bacteria (10^8 to 10^9 colony forming units per gram of soil dry weight [cfu/gm-dw soil] and hydrocarbon degraders (10^5 to 10^6 cfu/gm-dw soil) were found to be present within the soil (Alcoa Technology Center, 1996a). The results indicated that the addition of moisture and nutrients did not significantly alter degradation rates of the hydrocarbons.

- In 1995, on behalf of Alcoa, Morrison Knudson and Groundwater Technology performed field trial tests to evaluate the applicability of soil vapor extraction (SVE) and bioventing technologies as remedial alternatives to address the Stoddard solvent-impacted soils at the Site. Test procedures consisted of both vapor extraction and air injection with monitoring for oxygen, carbon dioxide, and soil gas. The report concluded that both technologies were viable and could be implemented if desired to remediate the Stoddard solvent-impacted soils (Alcoa Technical Center, 1996a).

- In 1996 Alcoa generated additional field respirometry testing data suggesting that naturally-occurring aerobic and anaerobic intrinsic bioremediation was on-going at the Site. The data indicated that natural aerobic degradation was occurring due to available molecular oxygen at rates of 200 to 400 milligrams per kilograms (mg/kg)/year. The data also indicated that much slower degradation rates of 7 mg/kg/year were occurring through anaerobic biodegradation. The report indicated that Alcoa proposed intrinsic bioremediation (also referred to as monitored natural attenuation) as the passive full-scale remediation approach for Stoddard solvent-impacted soils (Alcoa Technical Center, 1996b).

- Based on the soil investigations and treatability testing described in a report prepared by Environmental Protection and Compliance in 2006, Alcoa recommended to the City of Vernon H&EC that long term natural attenuation of the Stoddard solvent-impacted soils beneath Building 112A be allowed to continue as a passive remedy (Alcoa Technical Center, 1996c). The City of Vernon H&EC replied that the remaining Stoddard solvent concentrations still exceeded cleanup standards and required Alcoa to submit a plan by August 31, 2006 for active remediation of this area (City of Vernon, 2006). Alcoa has not submitted its active remediation plan and has not performed any additional monitoring or active remediation work in this area. Alcoa's refusal to submit an active remediation plan is documented in an August 30, 2006 letter it submitted to the City of Vernon H&EC (Alcoa, 2006).

- April 1998 – excavation of total petroleum hydrocarbon (TPH)-impacted soil in conjunction with removal of the Stoddard solvent Tube Mill dip tank located in Building 112A. The maximum excavation depth was 15 feet bgs. The area was backfilled with pea gravel and capped with concrete (A.J. Ursic, Jr., 1999a).

- June 1998 – excavation of TPH-impacted soil in conjunction with the removal of a sump from the 3-inch tube reducer foundation located in Building 112A. The maximum excavation depth was 5 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999a).

- October 1998 – excavation of refractory and asbestos-containing materials found in soil in conjunction with the construction of a sanitary pipeline located east of Building 112A. The maximum excavation depth was 4 feet bgs. The area was backfilled with clean road base and capped with asphalt (A.J. Ursic Jr., 1999a).

- December 1998 – excavation of PCB- and TPH-impacted soil in conjunction with the removal of an inert-waste disposal pit located west of Building 112A and south of the cooling tower. The maximum excavation depth was 45 feet bgs. Soil removal was terminated due to the proximity of the railroad tracks along the south and west sides of the excavation. The area was backfilled with clean soil and road base and capped with concrete (A.J. Ursic Jr., 1999a).

- January 1999 – excavation of PCB-impacted soil near storm water outfall #7 located west of Building 104. The maximum excavation depth was 6 feet bgs. The area excavated was limited by the presence of the adjacent sidewalk, building structures, and railroad tracks. The area was backfilled and capped with engineering base (A.J. Ursic Jr., 1999b).

- April 1999 – excavation of PCB-impacted soil at the discharge point of storm water outfall #6 located southwest of the cooling tower. The maximum excavation depth was 2 feet bgs. The area was backfilled and capped with clean road base (A.J. Ursic Jr., 1999a).

- April 1999 – excavation of PCB-impacted soil adjacent to the hot well along the north side of the cooling tower. The maximum excavation depth was 3 feet bgs. The area was backfilled and capped with clean road base (A.J. Ursic Jr., 1999a).

- May 1999 – excavation of PCB-impacted soil in conjunction with removal of a former condenser pad located outside the northwest corner of Building 106. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with concrete (A.J. Ursic Jr., 1999b).

- May 1999 – Excavation of lead-impacted soil from a former ceramic disposal pit located beneath Building 135 on Parcel 6. The maximum excavation depth was 2 feet bgs. The area was backfilled with native soil and capped with asphalt (A.J. Ursic Jr., 1999c).

- June 1999 – excavation of PCB-impacted soil in conjunction with the removal of a French drain in Press Pit #2 located in Building 106. The maximum excavation depth was 7 feet bgs. The area was backfilled and capped with concrete (A.J. Ursic Jr., 1999b).

The areas where previous remediation activities occurred as described above, including approximate horizontal limits of the excavation, excavation depth, and remaining chemicals of potential concern (COPC) concentrations, are shown on Figure 7. As discussed in Section 3.1, the City H&EC issued a closure letter to Alcoa in 1999 with the stipulation that Alcoa would continue to maintain responsibility for the Stoddard solvent-impacted soil. The letter also stated that further review or determinations may be necessary if new information related to environmental conditions at the Site is found (City of Vernon, 1999).

3.3 GEOMATRIX ASSESSMENTS

In June 2005, Geomatrix conducted a Phase I ESA (Geomatrix, 2005a) at the Vernon Facility to identify Recognized Environmental Conditions (RECs) as defined by ASTM International, Inc. E1527-00 for Phase I ESAs. In addition to identifying RECs, Geomatrix identified historical RECs and potential other environmental conditions (OECs) at the Site. The Phase I ESA report was submitted to the City of Vernon on September 1, 2005, and the City of Vernon H&EC concurred with the findings in their letter dated September 26, 2005. The findings of the Phase I ESA indicated the need for additional subsurface assessment work at the Site. Geomatrix submitted a Phase II ESA work plan (2005b) to the City of Vernon H&EC on September 2, 2005, and the work plan was approved by the City of Vernon H&EC on September 26, 2005 (City of Vernon, 2005). A summary of the Geomatrix assessments is described in the following subsections.

3.3.1 Phase II Investigation

Based on the findings of the previous investigations and the manufacturing operations in each building and/or area, these COPCs were identified:

- TPH, including Stoddard solvent;
- PCBs;
- VOCs;
- metals, including hexavalent chromium [Cr (VI)]; and
- semi-volatile organic compounds (SVOCs).

Based on Alcoa's historical groundwater monitoring results, VOCs; TCE; 1,2-DCA; and chloroform were identified as groundwater COPCs at the Site.

A Phase II investigation was conducted as the initial remedial investigation at the Site between November and December 2005. The investigation was conducted to evaluate whether the RECs or OECs identified in the Phase I ESA had resulted in releases to the subsurface soil and/or groundwater at the Site. The initial remedial investigation included the collection and analysis of soil vapor and soil samples for a number of constituents. The findings of the investigation were submitted to the City of Vernon H&EC in a report dated March 9, 2006 (Geomatrix 2006a).

Soil and soil vapor data collected during the Phase II investigation were evaluated using a stepped screening process to evaluate the potential for groundwater impacts and the potential for risks to human health due to exposure to shallow soil containing COPCs. The initial step of the screening process was to assess potential VOC impacts and the need to collect additional soil samples. Based on the soil vapor results obtained in Building 106, the collection and analysis of additional soil samples were required for further assessment of potential VOC impacts.

The second step of the screening evaluation included a comparison of the Phase II soil sample results to the following prescriptive regulatory screening levels.

- Los Angeles RWQCB Interim Site Assessment and Cleanup Guidebook (May 1996, and updated May 2004) groundwater protection screening levels for carbon range-specific petroleum hydrocarbons and aromatic hydrocarbons (benzene, toluene, ethylbenzene, and total xylenes [BTEX] compounds) in soil. The selected screening levels were obtained from Table 4-1 of the above-referenced RWQCB guidance assuming a sand lithology and a depth to groundwater of 150 feet.

- U.S. EPA Region IX Preliminary Remediation Goals (PRGs) for industrial sites and concentrations for VOCs, SVOCs, PCBs, and metals in soil (U.S. EPA, 2004).

- U.S. EPA Region IX soil screening levels (SSLs) for the protection of groundwater using a default dilution attenuation factor of 20 (DAF20) for VOCs, SVOCs, and metals, where available (U.S. EPA, 2004).

- California Background Concentrations of Trace and Major Elements in California Soil (Bradford, et. al., 1996).

- California Code of Regulations, Title 22, Total Threshold Limit Concentration and Soluble Threshold Limit Concentration for metals and PCBs in building materials (waste characterization), where applicable.

Based on the data collected during the Phase II assessment and the above screening evaluation process, certain areas at the Site were identified as impacted by one or more COPCs at concentrations above the screening criteria. Although the screening criteria are not intended to be remediation goals, they were used to evaluate the potential need for further action (such as additional assessment, analysis, or potential remediation). Remediation goals may differ from screening levels based on site-specific considerations (e.g., redevelopment, future land use, potential exposure pathways, etc.), regulatory requirements, evaluation of risk, or other relevant factors as set forth in NCP 40 CFR 300.

The following areas of the Site had COPCs that exceeded one or more of the screening criteria (the boring locations discussed below are shown on Figure 7). For each of these areas, the results of the Phase II assessments indicated that additional investigation was necessary and the City H&EC approved these subsequent investigatory actions on March 20, 2006.

- Building 104 – PCBs were detected in the concrete slab and soil to a depth of 3 feet bgs adjacent to the location of a saw (borings 41, 73, and 74). Additional soil borings were required around the location of the saw to assess the source and extent of PCBs detected in concrete and the underlying soil.

- Building 104 – PCBs were detected in soil to a depth of approximately 71.5 feet bgs in the vicinity of a vertical pit and a former vertical pit (boring 40). Additional soil borings were required around both vertical pits to assess the source and extent of PCBs detected in soil.

- Buildings 106 and 108 – TCE was detected in soil beneath the northern portion of the buildings to a depth of approximately 48 feet bgs (boring 14), and TCE was detected in soil vapor. Additional assessment of the lateral extent of TCE in soil and its potential impacts to groundwater was required in this area.

- Building 112 (former etch station) and near storm water outfall #6 – one or more metals were detected in soil to a depth of 6 feet bgs (boring 113). Additional assessment of the lateral extent of metals in shallow soil was required in these areas.

- Former substation #8 – PCBs were detected in the soil/gravel drainage area of the former substation to a depth of 2.2 feet bgs (boring 39), but they were not detected in the soil boring adjacent to the soil/gravel drainage area. Additional assessment of the depth of the soil/gravel drainage area and the concentrations of PCBs in these materials was required.

Although concentrations of COPCs in other areas of the Site did not exceed screening criteria, additional remedial investigations were required by the City of Vernon H&EC at three locations to gain an understanding of the source of the deeper soil impacts and to confirm that soil concentrations were not increasing with depth. These three locations are listed below.

- Building 106 – Stoddard solvent-range petroleum hydrocarbons were detected in one soil sample at a depth of approximately 47 feet bgs (boring 13). Because these hydrocarbon compounds were not detected in shallow soil at this boring or in soil vapor in the vicinity of the boring, further evaluation of the source of these compounds at 47 feet bgs in soil was required.

- Building 112 – TPH concentrations in soil increased with depth at a boring drilled to a depth of 9.6 feet adjacent to a former sump (boring 30). Although the hydrocarbon concentrations were below the screening levels, their vertical extent in soil adjacent to the sump had not been characterized and required further evaluation.

- Cooling tower area – Cr (VI) and PCBs (Aroclor 1248) were detected in one soil sample from boring 46 at a depth of 21.1 feet bgs (the bottom of the boring). PCBs and Cr (VI) were not detected in shallow soil samples collected from boring 46, and therefore, further evaluation of the source of PCBs and Cr (VI) detected at 21.1 feet bgs in soil was required.

3.3.2 Supplemental Phase II Investigation

The Phase II remedial investigation results indicated a need to 1) assess the extent of impacted soil exceeding the screening criteria, 2) assess potential impacts to groundwater, and 3) further understand the subsurface conditions at the Site for each of the areas identified in Section 3.3.1. Therefore, a Supplemental Phase II investigation was required in specific areas of the Site to further characterize the extent of impacted soil and/or existing subsurface conditions for the reasons described above in Section 3.3.1. On March 9, 2006, Geomatrix submitted a proposed plan to the City of Vernon H&EC to further characterize the extent and potential significance of COPCs exceeding screening criteria in soil at the Site and the potential impacts to groundwater related to TCE detections in soil and soil vapor in Buildings 106 and 108. On March 20, 2006 the City of Vernon H&EC approved the Supplemental Phase II investigation plan, and the investigation was conducted between March 28, 2006 and April 24, 2006.

Based on the findings of the initial Supplemental Phase II investigation, a follow-up investigation was required to further characterize the extent of VOCs detected in soil, soil vapor, and groundwater in the north portion of the Site. In a letter to the City of Vernon H&EC dated May 9, 2006, Geomatrix identified additional sampling points in Buildings 106, 108, and 112. Under approval and direction from the City Vernon H&EC, the additional investigation work began on May 11, 2006 and was completed on May 24, 2006. The findings of the Supplemental Phase II investigation were submitted to the City of Vernon H&EC in a report dated December 19, 2006.

Soil data collected during the Supplemental Phase II investigation were evaluated using the stepped screening process discussed in Section 3.3.1, and sample locations where COPCs were detected above the screening levels are described in Section 3.3.3.

3.3.3 Geomatrix Concrete Characterization

In addition to the concrete testing conducted during the Phase II investigation, coring, and testing of the concrete building slabs and concrete transformer pads were performed during and after above-grade demolition work to further characterize the former concrete building slabs that were impacted with PCBs. PCBs were detected in concrete samples at concentrations greater than 1 mg/kg in portions of Buildings 104, 106, 108, 110, 112, and 112A. A summary of PCB concentrations detected in the concrete samples is shown on Figure 8 and provided in Appendix A.

3.3.4 Areas of Impact

Although the screening criteria described in Section 3.3.1 are not intended to be remediation goals, one or more COPCs detected in soil and concrete during the Phase II and Supplemental Phase II investigations were above these screening criteria. The areas identified, as impacted by one or more COPCs with concentrations exceeding these initial screening criteria are described below. With the exception of storm water outfall #6, these areas were not previously identified by Alcoa as being impacted by VOCs or PCBs.

- Northern Portion of Buildings 106, 108, and 112 – TCE was detected in soil vapor, soil, and groundwater in the northwestern portion of the Site. Data collected to date indicate that a source of VOCs in soil and groundwater was likely present in the northwest corner of Building 106. TCE and tetrachloroethene (PCE) concentrations detected in soil exceed the U.S. EPA Region IX SSL for the protection of groundwater (using a DAF20) in this area. TCE was also detected in groundwater samples from 150 feet bgs at concentrations ranging from 72 to 420 µg/L. In addition, PCBs were detected in the concrete slab in portions of these buildings.

- Southern Portion of Building 106 – aromatic VOCs, primarily benzene, were detected in soil and groundwater in the southern portion of the building at borings 125 and 135. Benzene was detected in groundwater samples at concentrations ranging from 2.8 to 3.3 µg/L. PCBs also were detected in the concrete slab within the southwest corner of this building.

- Existing and Former Vertical Pits Building 104 – PCBs were detected in soil to a depth of 31 feet bgs at boring 98 and at depths between 10 and 71.5 feet bgs at borings 40, 94, and 95.
- Northwestern portion of Building 104 – PCBs were detected in the concrete slab in the northwest corner of the building. PCBs were not found at detectable concentrations in soil samples from borings 115, 116, 117, 118, and 119 located in this area of the building.
- Saw in Building 104 – PCBs were detected in soil to a depth of 3 feet bgs at borings 41, 73, and 110b. PCBs were also detected in the overlying concrete slabs near these boring locations and surrounding the location of the saw.
- Near storm water outfall #6 – copper and lead were detected at a depth of 6.2 feet bgs at former boring 47, and arsenic was detected at a depth of 5.5 feet bgs at boring 113.

In order to further evaluate these areas of impacted soil or concrete, the Phase II data, the Supplemental Phase II investigation data, and all other COPCs detected in soil and soil vapor at the Site were evaluated for potential human health risks using a screening human health risk assessment (HHRA). The screening HHRA is presented in Section 4.0. The potential impacts of these COPCs to groundwater are evaluated in Section 4.3.

3.3.5 Above-Grade Facility Demolition

Facility above-grade and below-grade demolition is being conducted separately; the above-grade hazardous materials abatement and demolition work was completed at the Site in November 2006 under the direction of the City of Vernon H&EC. The concrete building slabs (including those impacted with PCBs) and surrounding pavements were not removed during the above-grade demolition work. These features remain in-place and will be addressed as part of the below-grade demolition work. Furthermore, additional testing of the concrete slabs for PCBs has been conducted and was described earlier in Section 3.3.3. A summary of the above-grade demolition work is included in the Above Grade Demolition Completion Report dated December 26, 2006 (Geomatrix, 2006e).

4.0 SCREENING-LEVEL HUMAN HEALTH RISK ASSESSMENT

This section presents the SCM developed for the Site and the screening-level HHRA conducted to evaluate potential human health risks associated with exposures to COPCs. This screening-level HHRA was conducted for individual "Phase areas" at the Site, that were developed to facilitate future below-grade demolition work and the anticipated plans for redevelopment; which may include the construction and operation of a power plant and/or commercial/industrial facilities. The “Phase” terminology is not meant to represent a sequential order of implementation of the below-grade demolition activities, but describes the primary locations where the activities will be conducted. The Phase I through VI areas related to the layout of the proposed power plant are briefly described below, and are shown on Figure 4.

- Phase I and II areas cover the majority of the proposed footprint of the power plant development and include Buildings 104, 106, 108, 110, 112, and the northern portion of 112A.

- The Phase III area includes the hot well/cooling tower and adjacent pavements that are located outside the buildings, including the former UST area southwest of Building 112A known to contain Stoddard solvent-impacted soil. This area was separated further to distinguish the hot well/cooling tower area (the Phase IIIa area) from the Stoddard solvent-impacted former UST area (the Phase IIIb area) (Figure 7). Pursuant to the March 28, 2008 letter from the RWQCB, Alcoa is responsible for completing the assessment work related to the former USTs and the Stoddard solvent impacted soils. The Phase IIIa and IIIb areas are located outside the proposed footprint of the power plant development.

- The Phase IV area, which is located outside the footprint of the proposed power plant development, has known Stoddard solvent soil impacts. Pursuant to the March 28, 2008 letter from the RWQCB, Alcoa is responsible for completing the assessment work related to the Stoddard solvent impacted soils. This area is proposed for use as an equipment lay down area during the power plant construction.

- The Phase V area includes Parcel 6 located south of Building 112A. This area is located outside the proposed footprint of the power plant development.

- The Phase VI area includes the eastern parking lot and paved areas. This area is located outside the proposed footprint of the power plant development.

4.1 SITE CONCEPTUAL MODEL

As described in U.S. EPA’s “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” (U.S. EPA, 1988), the purpose of a SCM is to describe what is known about chemical sources, migration pathways, exposure routes, and receptors at a Site. The SCM depicts the exposure pathways and the mechanisms by which a receptor may come into contact with COPCs in the environment. Using the U.S. EPA Risk Assessment Guidance for Superfund (U.S. EPA, 1989), potential exposure pathways applicable to the Site have been identified and addressed. An exposure pathway is defined by four elements (U.S. EPA, 1989):

- a source and mechanism of COPC release to the environment;

- an environmental medium of concern (e.g., air, soil) or transport mechanism (e.g., volatilization) for the released COPC;

- a point of potential contact with the medium of concern; and
- an exposure route (e.g., ingestion) at the contact point.

An exposure pathway is considered "complete" if all four of these elements are present. Only complete exposure pathways need to be evaluated for the purposes of a risk assessment. The characterization of the potential exposure pathways at the Site, based on existing information, is presented in the SCM (Figure 9).

There is no current use of the Vernon Facility; but the property is being purchased by the City of Vernon for commercial/industrial redevelopment with the potential for a portion of the Site to be used as a power plant. Based on U.S. EPA's directive requiring the consideration of reasonably anticipated future land use (U.S. EPA, 1995), potential future human receptors at the Site include power plant facility workers or workers under an alternative commercial/ industrial use (if the power plant is not developed) and construction workers involved in the future construction and grading activities during Site redevelopment. The construction worker receptor is also intended to address potential exposure by future short-term utility maintenance workers and landscape workers. No other land use (i.e., residential) is reasonably anticipated for the Site given current zoning for industrial use and the likely future use.

As discussed in Section 3.0, prior remedial investigations identified TPH, PCBs, VOCs, and metals in soil; PCBs in concrete; and VOCs in soil vapor and groundwater. The identification of potentially complete exposure pathways for the COPCs in each exposure medium is discussed below.

4.1.1 Potential Exposure to COPCs in Soil

According to the City of Vernon H&EC, the depth of future below-grade excavation at the Site will encompass the upper 15 feet of soil (City of Vernon H&EC letter dated February 6, 2007). Exposure of future construction workers was therefore considered complete within the upper 15 feet of soil. It was also assumed that these soils could be redistributed at the land surface during excavation and grading, creating potential future exposure for on-site workers (power plant facility workers or workers under an alternative commercial/industrial use, hereafter collectively referred to as commercial/industrial workers). The exposure pathways considered complete for COPCs in soil for both construction workers and commercial/industrial workers and evaluated in the HHRA include:

- incidental ingestion of soil;
- dermal contact with soil; and
- inhalation of particulates in ambient air.

Exposure was also considered complete for the volatile COPCs in soil via inhalation of these compounds in air. However, soil vapor is considered a more appropriate medium than soil for assessing potential vapor migration. As a result, soil vapor data were used to evaluate potential vapor migration to air and inhalation exposure (Section 4.1.4).

4.1.2 Potential Exposure to COPCs in Concrete

Concrete present in former building slab areas of the Site may be demolished on site, crushed, and reused as fill in soil and foundation removal areas. A letter from the City of Vernon H&EC dated February 6, 2007, required Pechiney to implement alternative criteria to the proposed tiered approach for the reuse of PCB-impacted concrete as fill material, which was originally presented in the PCB Notification Plan (Geomatrix, 2006c) to the City of Vernon H&EC. Crushed concrete with PCB concentrations less than 25 mg/kg could be reused as fill at depths greater than 15 feet below grade. Crushed concrete with PCB concentrations less than 1 mg/kg could be reused as fill material without restrictions. Future construction workers involved in the redevelopment of the Site may be potentially exposed to PCBs in this crushed concrete fill. Specifically, exposure may be complete via the pathways identified above for exposure to COPCs in soil. Exposure was considered incomplete for future commercial/industrial workers as these receptors are not expected to come into direct contact with crushed concrete once the Site has been redeveloped.

4.1.3 Potential Exposure to COPCs in Groundwater

Prior remedial investigations identified VOCs in groundwater beneath the Site, specifically at a depth of approximately 150 feet bgs in the Exposition aquifer. However, drinking water is produced off-site from a different aquifer at depths greater than 450 feet bgs. As a result, there is no anticipated direct exposure to groundwater at the Site. Furthermore, with groundwater beneath the Site first encountered near 150 feet bgs, vapor migration from groundwater is considered incomplete based on U.S. EPA guidance (U.S. EPA, 2002a). As a result, there are no complete exposure pathways to COPCs in groundwater and such exposure need not be further evaluated.

Although groundwater beneath the Site is not currently used as a drinking water source, the potential threat of COPC migration from soil to groundwater will be evaluated for the future protection of groundwater quality.

4.1.4 Potential Exposure to COPCs in Soil Vapor

Prior remedial investigations identified VOCs in soil vapor, which is a more appropriate medium than groundwater or soil for assessing potential migration to air. The VOCs detected in soil vapor samples collected at 5 and 15 feet bgs have the potential to migrate into indoor or ambient air. The exposure pathways considered complete for volatile COPCs in soil vapor and evaluated in the HHRA include:

- inhalation of volatiles in ambient air; and
- inhalation of volatiles in indoor air (for commercial/industrial workers only).

4.2 DEVELOPMENT OF SCREENING LEVELS AND HUMAN HEALTH RISK ASSESSMENT

Potential human health risks for on-site commercial/industrial workers and construction workers were evaluated using screening levels as described herein. Geomatrix used California Human Health Screening Levels (CHHSLs) where available and developed RBSLs for chemicals for which CHHSLs were not available or when exposure scenarios were not evaluated by the Office of Environmental Health Hazard Assessment (OEHHA) (e.g., for the evaluation of potential risks to construction workers) (OEHHA, 2005).

This screening-level HHRA followed guidelines specified in U.S. EPA and California Environmental Protection Agency (Cal-EPA) for the performance of risk assessments as specified in the following documents:

- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part A), U.S. EPA, Office of Emergency and Remedial Response, December 1989 (U.S. EPA, 1989);
- Supplemental Guidance for Human Health Multimedia Risk Assessments of Hazardous Waste Sites and Permitted Facilities, Cal-EPA, Department of Toxic Substances Control (DTSC), Office of the Science Advisor, July 1992, corrected and reprinted, 1996 (DTSC, 1996);
- Preliminary Endangerment Assessment Guidance Manual, Cal-EPA, DTSC, 1999 (DTSC, 1999a); and
- Human-Exposed-Based Screening Numbers Developed to Aid Estimation of Cleanup Costs for Contaminated Soil, OEHHA, updated January 2005 (OEHHA, 2005).

Other regulatory reference documents were used as appropriate to supplement the information in these documents.

4.2.1 Data Evaluation

The analytical data used for the HHRA were those collected prior to and during the Geomatrix Phase II and Supplemental ESAs, as presented in Appendix A. Data excluded from consideration are listed below.

- Non-discrete TPH data, including Stoddard solvent compounds in soil. Neither U.S. EPA nor OEHHA have developed toxicity criteria for non-discrete TPH (U.S. EPA, 2007; OEHHA, 2007). For site investigations conducted in California, non-discrete TPH risks are typically calculated by analyzing for and assessing exposures to the most toxic TPH components (DTSC, 1993). For lighter-end gasoline range petroleum fractions, these constituents include BTEX. For heavier-end range petroleum fractions (diesel range and motor oil range TPH), these constituents include polynuclear aromatic hydrocarbons. BTEX has been analyzed in many of the samples where TPH was detected or in the general vicinity of samples where TPH was detected. Non-discrete TPH data have been evaluated outside of the HHRA based on comparisons to RWQCB criteria (1996) for potential impacts to groundwater (Section 4.3).

- VOC data in the Phase IIIb and Phase IV areas. The VOCs detected in these areas are considered constituents of Stoddard solvent. These data were not included in our evaluation because Alcoa retains the responsibility to further characterize the Stoddard solvent-impacted soils under the jurisdiction of the RWQCB.

- Data from soil samples collected below 15 feet bgs. Based on the SCM (Figure 9), direct and indirect exposure to COPCs in deep soil (greater than 15 feet bgs) is considered incomplete. However, outside of the HHRA, data from all soil samples were used to evaluate potential continued and future impacts to groundwater (Section 3.3), with concentrations of PCBs and several VOCs exceeding the screening criteria for potential impacts to groundwater and subsequently subjected to more detailed leaching and migration modeling analysis (Section 4.3).

- Concentrations of metals in soil that are less than 5/6th of the maximum background levels established for the Site as presented in Bradford, et al. (1996) and as modified by the City of Vernon H&EC. For arsenic, a site-specific background concentration of 10 mg/kg was derived from recent assessment work conducted on a nearby property (City of Vernon H&EC, letter dated April 28, 2008)

- Data from soil samples no longer in place following excavations (including excavation of dip tanks, sumps, storm water outfall discharge areas, waste disposal pits, and USTs). These samples are marked as “excavated” or “E” in Appendix A.

The COPCs identified after data reduction and carried through the quantitative HHRA are listed below. The COPCs identified in shallow soil (0 to 15 feet bgs) are listed below.

- VOCs – ethylbenzene, PCE, TCE, toluene, m,p-xylenes, and o-xylene

- Metals – arsenic, cadmium, copper, lead, mercury, and zinc

- PCBs – Aroclor-1232, Aroclor-1248, Aroclor-1254, and Aroclor-1260

The COPCs identified in shallow soil vapor (5 and 15 feet bgs) included chloroform, 1,1-dichloroethylene, PCE, TCE, toluene, 1,1,1-trichloroethane, and m,p-xylenes.

4.2.2 Risk-Based Screening Levels

RBSLs were developed for each receptor (i.e., commercial/industrial worker and construction worker) for the media to which that receptor is exposed. The methodology used to develop the RBSLs is presented in Appendix B. Separate RBSLs were developed for lead in soil using the DTSC's LeadSpread model (Version 7.0) (DTSC, 1999b). The RBSLs for VOCs in soil were developed excluding inhalation exposures. Volatilization of chemicals from the subsurface to ambient or indoor air was evaluated using soil vapor measurements and RBSLs developed for this data. Therefore, the approach for evaluating VOCs for commercial/industrial workers and construction workers consisted of the following.

- RBSLs for VOCs in soil were developed to address dermal contact with soil and soil ingestion exposures for the outdoor commercial/industrial worker and construction worker.
- RBSLs for VOCs in soil vapor were developed to address indoor inhalation exposures for the indoor commercial/industrial worker using the 1991 Johnson & Ettinger model and to address outdoor inhalation exposures for the outdoor commercial/industrial worker and construction worker.

Tables 1 and 2 present a summary of the RBSLs developed for each receptor for the COPCs in soil and soil vapor, respectively.

4.2.2.1 Commercial/Industrial Workers (Indoor and Outdoor)

CHHSLs for chemicals in soil and soil vapor at a commercial/industrial site (OEHHA, 2005) were used where available to evaluate potential human health risks for future, on-site commercial/industrial workers. RBSLs comparable to these CHHSLs were developed for the other chemicals detected following the OEHHA (2005) methodology and exposure parameters from OEHHA (2005) and U.S. EPA (1991, 1996). Future commercial/industrial workers at the Site were evaluated for two scenarios: workers assumed to spend 100 percent of their time indoors and workers assumed to spend 100 percent of their time outdoors. As presented in Appendix B, RBSLs were developed for both soil and soil vapor measurements for outdoor and indoor commercial/industrial worker exposure.

The LeadSpread model was used to develop RBSLs for lead in soil for commercial/industrial workers based on exposure assumptions for the outdoor commercial/industrial worker.

4.2.2.2 Construction Workers

CHHSLs have not been developed by OEHHA for construction workers. Site-specific RBSLs were developed using exposure assumptions for construction workers published by the DTSC (1996) and U.S. EPA (1991, 2002b), and toxicity criteria published by OEHHA or U.S. EPA (Appendix B). The RBSLs developed for PCBs in soil also apply to PCBs in concrete.

The LeadSpread model was used to develop RBSLs for lead in soil for construction workers based on exposure assumptions for the construction worker.

4.2.3 Risk Evaluation

The risk evaluation was conducted as a screening-level assessment to evaluate worst-case exposure scenarios and identify any chemicals contributing significantly to predicted cancer risks and noncancer hazard indexes (HI) (U.S. EPA, 1989). Risks from exposure to COPCs in soil and soil vapor were evaluated independently for each Phase area defined in Section 4.0 and presented on Figure 4. Maximum concentrations of chemicals in soil and soil vapor in each Phase area were identified by reviewing current and historical data. As described in OEHHA guidance (2005), comparison of a chemical concentration to a CHHSL or RBSL can predict the lifetime excess cancer risk or noncarcinogenic hazard quotient (HQ) for exposure to that chemical in the exposure medium. A cancer risk ratio was calculated for exposure to each carcinogen by dividing the maximum chemical concentration by the appropriate cancer-based RBSL. Multiplying each risk ratio by the target risk level used in the development of the RBSL (i.e., one-in-one million or $1x10^{-6}$) then results in a predicted lifetime excess cancer risk for exposure to that chemical concentration. Similarly, for noncarcinogens, HQs were calculated by dividing the maximum chemical concentration by the appropriate noncancer-based RBSL and multiplying by the target HQ used in the development of the RBSL (i.e., 1). Cumulative effects from exposure to multiple chemicals were evaluated by summing the estimated chemical-specific cancer risks or HQs by exposure medium (soil and soil vapor), and then summing across all media to estimate cumulative exposure within each Phase area.

Concrete impacted with PCBs was not included in the cumulative risk evaluation. With crushed concrete proposed for re-use at the Site as potential fill materials, potential exposure to PCB-impacted concrete during redevelopment of the Site was evaluated separately using the RBSLs calculated for PCBs in soil. Concentrations of Aroclor-1248 in concrete in the Phase I and Phase II areas (Appendix A) were found to exceed the construction worker RBSL (7.6 mg/kg).

U.S. EPA guidance on exposure levels considered protective of human health was followed to aid in the interpretation of the HHRA results. In the NCP 40 CFR 300.430(e)(i), U.S. EPA defined general remedial action goals for CERCLA sites. The goals included a range for residual cancer risk, which is "an excess upper-bound lifetime cancer risk to an individual of between 10^{-4} [1E-04] and 10^{-6} [1E-06]," or 1 in 10,000 to 1 in 1,000,000. The goals set out in the NCP 40 CFR 300.430(e)(i)(A)(2) are applied once a decision has been made to remediate a site. A more recent U.S. EPA directive (U.S. EPA, 1991) provides additional guidance on the role of the HHRA in supporting risk management decisions, and in particular, determining whether remedial action is necessary at a site. Specifically, the guidance states, "Where cumulative carcinogenic site risk to an individual based on reasonable maximum exposure for both current and future land use is less than 10^{-4}, and the noncancer HQ is less than 1, action generally is not warranted unless there are adverse environmental impacts." U.S. EPA Region IX has stated, however, that action may be taken to address risks between 10^{-6} and 10^{-4}. For that reason, the range between $1x10^{-6}$ and $1x10^{-4}$ is referred to as the "risk management range" in this HHRA.

The results of the HHRA are presented in Tables 3 through 14 and discussed below. As is standard practice in risk assessment (U.S. EPA, 1989), this section also provides an analysis of the uncertainty in the risk evaluation process.

4.2.3.1 Non-Lead Exposures

Using maximum chemical concentrations in soil, the screening-level HHRA resulted in the predicted lifetime excess cancer risks and noncancer HQs for outdoor commercial/industrial workers and construction workers presented in Tables 3 through 7, and summarized in Table 8. Using maximum chemical concentrations in soil vapor, the screening-level HHRA resulted in the predicted lifetime excess cancer risks and noncancer HQs for commercial/industrial workers and construction workers presented in Tables 9 through 11, and summarized in Table 12. The predicted lifetime excess cancer risks and noncancer HIs for cumulative exposures in each Phase area are presented in Table 13.

As presented in Table 13, the predicted lifetime excess cancer risks for the indoor commercial/industrial worker in the Phase I area; the outdoor commercial/industrial worker in the Phase II, Phase IIIa, Phase IV, and Phase VI areas; and the construction worker in the Phase II and Phase IV areas are above the risk management range. The other cancer risks estimated were either within or below this risk management range. The maximum predicted noncancer HIs for the indoor commercial/industrial worker in the Phase I area and the construction worker in the Phase IIIa and Phase IV areas are above the acceptable range for noncarcinogenic effects (less than or equal to 1). The other HIs estimated were all at or below 1, with the majority well below 1. In summary, maximum concentrations of chemicals resulted in risks or hazard indexes above target levels in the Phase I, Phase II, Phase IIIa, Phase IV, and Phase VI areas for one or more receptors.

Certain chemicals individually contributed cancer risk levels of at least $1x10^{-6}$ or HQs of at least 1. These were considered key chemicals in each Phase area. Specifically, the following key chemicals were identified in soil and soil vapor, as presented in Tables 3 through 7 (key chemicals in soil) and Tables 9 through 11 (key chemicals in soil vapor).

- Phase I area: Aroclor-1248 and Aroclor-1260 in soil for both outdoor commercial/industrial workers and construction workers; chloroform, PCE, and TCE in soil vapor for indoor commercial/industrial workers.

- Phase II area: Aroclor-1248 in soil for both outdoor commercial/industrial workers and construction workers.

- Phase IIIa area: Aroclor-1248, Aroclor-1254, and arsenic in soil for outdoor commercial/industrial workers; Aroclor-1254 and arsenic in soil for construction workers.

- Phase IV area: Aroclor-1232, Aroclor-1260, and arsenic in soil for outdoor commercial/industrial workers; Aroclor-1232 and arsenic in soil for construction workers.

- Phase VI area: arsenic in soil for both outdoor commercial/industrial workers and construction workers.

4.2.3.2 Exposure to Lead in Soil

Exposure to lead in soil was evaluated independently of exposure to the other COPCs. As described in detail in Appendix B, the RBSLs for lead in soil, developed using LeadSpread (DTSC, 1999b), are based on blood-lead as a biomarker for potential health concerns. In contrast, the RBSLs for all other COPCs are based on chemical intake and chemical-specific toxicity factors.

Table 14 presents the results of comparing the maximum detected concentrations of lead in each Phase area to the RBSLs developed for commercial/industrial worker or construction worker exposures. The comparisons are presented as "risk ratios," with a ratio higher than 1 indicating that the RBSL is exceeded. As presented in Table 14, the maximum detected concentrations of lead in soil in the Phase I, Phase IIIb, Phase IV, Phase V, and Phase VI areas were below background. The maximum detected concentration of lead in soil in the Phase II and Phase IIIa area were above background, but they did not exceed the RBSLs for the outdoor commercial/industrial worker or the construction worker. Based on this analysis, the concentrations of lead detected in soil at the Site are not considered to be significant with respect to potential health effects.

4.2.3.3 Uncertainty

Uncertainty is inherent in many aspects of the risk assessment process, and generally arises from a lack of knowledge of 1) site conditions, 2) toxicity and dose-response of the COPCs, and 3) the extent to which an individual will be exposed to those chemicals (U.S. EPA, 1989). This lack of knowledge means that assumptions must be made based on information presented in the scientific literature or professional judgment. While some assumptions have significant scientific basis, others have much less. Pursuant to U.S. EPA requirements (1989), the assumptions that introduce the greatest amount of uncertainty and their effect on the noncarcinogenic and carcinogenic risk estimates must be included as part of the HHRA. The uncertainty associated with the development of RBSLs is presented in Appendix B. Uncertainty relative to data evaluation and the RBSL comparison is included herein.

- The identification of site-related COPCs was based upon the results of the sampling and analytical programs established for the Site. The factors that contribute to the uncertainties associated with the identification of COPCs are inherent in the data collection and data evaluation processes, including appropriate sample locations, adequate sample quantities, laboratory analyses, data validation, and treatment of validated samples.

- The predominant sources of uncertainty and potential bias associated with site characterization are based on the procedures used for site investigation (including sampling plan design and the methods used for sample collection, handling, and analysis) and from the procedures used for data evaluation. A relatively comprehensive sampling program was implemented to account for the chemicals most likely to be present at the Site as a result of site history and past activities.

- The use of maximum detected concentrations in the screening-level HHRA represent worst-case conditions and are representative of conditions in the most impacted areas of the Site.

- One source of uncertainty that is unique to risk characterization is the assumption that the total risk associated with exposure to multiple chemicals is equal to the sum of the individual risks for each chemical (i.e., the risks are additive). Other possible interactions include synergism, where the total risk is higher than the sum of the individual risks, and antagonism, where the total risk is lower than the sum of the individual risks. Relatively little data are available regarding potential chemical interactions following environmental exposure to chemical mixtures. Animal studies suggest however, that synergistic effects will not occur at levels of exposure below their individual effect levels (Seed, et al., 1995). As exposure levels approach the individual effect levels, a variety of interactions may occur, including additive, synergistic, and antagonistic (Seed, et al., 1995). Current U.S. EPA guidance for risk assessment of chemical mixtures (U.S. EPA, 1989) recommends conducting the risk assessment assuming an additive effect following exposure to multiple chemicals (excluding lead, given the different means by which potential health concerns are evaluated). Subsequent recommendations by other parties, such as the National Academy of Sciences (National Research Council, 1988) and the Presidential/Congressional Commission on Risk Assessment and Risk Management (Risk Commission, 1997) have also advocated a default assumption of additivity. As currently practiced, risk assessments of chemical mixtures generally sum cancer risks regardless of tumor type and sum non-cancer hazard indices regardless of toxic endpoint or mode of action.

In summary, these and other assumptions contribute to the overall uncertainty in the development of RBSLs. However, given that the largest sources of uncertainty generally result in overestimates of exposure or risk, it is believed that results presented in this document are based on conservative estimates.

4.3 SOIL CONDITIONS FOR PROTECTION OF GROUNDWATER

In addition to the human health exposure evaluation presented in Section 4.2, COPCs in soil were also evaluated for potential impacts to groundwater. COPCs detected in shallow and deeper soils (below 15 feet bgs) were evaluated with respect to a potential threat to groundwater using the groundwater protection screening levels described in Section 3.3.1. Specifically, RWQCB screening criteria for TPH and BTEX compounds and U.S. EPA Region IX SSLs were used as available for COPCs detected in soil at the Site. Consistent with the screening-level HHRA (Section 4.2), non-discrete TPH data and VOC data from the Phase IIIb and Phase IV areas were not included in this evaluation. This data is considered representative of Stoddard solvent impacts that will be addressed by Alcoa under the jurisdiction of the RWQCB.

COPCs with soil concentrations that exceeded available screening levels for the protection of groundwater quality (Appendix A) are described below by Phase area.

- Phase I Area - TCE, PCE, 1,2-DCA, benzene, and toluene were detected in soil at concentrations above their respective screening levels for the protection of groundwater quality (these five COPCs were also detected in groundwater observed at a depth of 150 feet bgs in this portion of the Site, beneath Buildings 106, 108, and 112).

- Phase IIIa Area – In one sample, IWDP-N at 10 feet bgs (excavation side wall sample), TPH as c10-c20 hydrocarbons and c21-c28 hydrocarbons were detected in soil at concentrations above RWQCB criteria for TPH as diesel (used as a surrogate criterion for c10-c20 hydrocarbons) or TPH as residual fuel (used as a surrogate criterion for c21-c28 hydrocarbons). As described in Section 3.2, soil from this location (referred to as the inert-waste disposal pit) was previously excavated, and soil removal was terminated due to the proximity of the railroad tracks along the south and west sides of the excavation.

Additional COPCs detected in soil for which the initial soil screening levels for the protection of groundwater were not available include 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, isopropylbenzene, n-butylbenzene, n-propylbenzene, and PCBs. One or more of these compounds were detected in soil in the Phase I and Phase II areas.

Following this initial screening, site-specific soil screening levels for the protection of groundwater were developed for the COPCs identified as above the initial screening levels or for which such screening levels were not available using either a chemical attenuation analysis or numerical modeling method. Chemical attenuation analyses were performed for VOCs, while numerical modeling was performed for PCBs. Development of these site-specific screening levels was based on the maximum contaminant level (MCL) or the California Department of Public Health (DPH) notification level of these chemicals. For VOCs, the site-specific soil screening levels were estimated as a function of depth from the ground surface, based on site lithology, using the Attenuation Factor (AF) method developed by the Los Angeles RWQCB (1996). The chemical attenuation analyses performed for the selected VOCs and the resulting site-specific soil screening levels are described further in Section 4.3.1 below.

Because PCBs have a significantly higher soil sorption factor than the compounds addressed in the RWQCB's AF method, it is inappropriate to use the AF method to establish soil screening levels for PCBs. Instead, numerical modeling was performed to simulate the fate and transport of PCBs in a one-dimensional soil column in the vadose zone. The analyses performed for PCBs and the resulting site-specific soil screening levels are described further in Section 4.3.2 below.

Because MCLs or California DPH notification levels are not available for carbon range-specific TPH in groundwater, site-specific soil screening levels for TPH were not established using the AF or modeling methods. Therefore, the initial RWQCB screening criteria for TPH was used as the site-specific soil screening levels for the protection of groundwater.

4.3.1 Site-specific Screening of Selected Volatile Organic Compounds in Soil for Protection of Groundwater

As described above, the site-specific soil screening levels for the protection of groundwater for selected VOCs were estimated following the procedures based on the AF method described in the Los Angeles RWQCB guidance (1996). The lithologic profile, classified as a mixture of gravel, sand, silt, and clay, was based on the logs of borings 125 and 126, advanced to groundwater at the Site (approximately 150 feet bgs) by Geomatrix. As similar lithology has been encountered throughout the Site as described in Section 2.3.2.1, the lithologic profile developed from these two borings was considered representative of site-wide conditions. The calculations were implemented in Mathcad® (Parametric Technology Corporation, 2007) worksheets and are presented in Appendix C with the depth-specific screening levels summarized in Table 15.

Several soil concentrations of VOCs in the Phase I Area (Appendix A) were identified as exceeding the estimated site/depth-specific soil screening levels for the protection of groundwater. Specifically, TCE, PCE, 1,2-DCA, benzene, and toluene were detected at concentrations in soil above their respective depth-specific screening levels.

4.3.2 Site-specific Screening of PCBs in Soil and Concrete for Protection of Groundwater

The site-specific soil screening levels for PCBs were estimated by simulating the fate and transport of PCBs in a one-dimensional soil column. Numerical simulations were performed using the commercial software MODFLOW-SURFACT developed by HydroGeologic, Inc. (2006). This code is based on the most commonly used groundwater modeling software, MODFLOW (Harbaugh et al., 2000), with an additional capability to simulate the vadose zone using the Van Genuchten's model. MODFLOW-SURFACT is similar to the one-dimensional vadose zone transport model, VLEACH (Ravi and Johnson, 1994).

Consistent with the modeling of VOCs described in Section 4.3.1 above, the lithologic profile assumed in the PCB modeling was also based on the logs of borings 125 and 126. Thirty-one 5-foot-thick soil layers were used to simulate the vadose zone and a 50-foot-thick layer was used to represent the saturated zone in the model. For each boring log, the percentages of gravel, sand, silt, and clay in 5-foot intervals were estimated. The percentages of gravel, sand, silt, and clay in each model layer were computed by averaging the percentages at the two boring locations. The hydrogeologic parameters and Van Genuchten's model parameters were estimated using the computer code ROSETTA developed by the Salinity Laboratory of the United States Department of Agriculture (2000). A reverse calculation method was then used to estimate the ratios of PCB concentrations in pore water at a source at 15 feet, 30 feet, and 45 feet below ground surface and the PCB concentration in pore water immediately above the water table after 500 years. The simulations showed that these ratios are all greater than ten billion (1×10^{10}). These ratios were then used as attenuation factors to back-calculate the total PCB concentration in soil resulting in a groundwater concentration equal to the MCL. All calculations using the MODFLOW-SURFACT simulation results were implemented in Mathcad® (Parametric Technology Corporation, 2007) worksheets and are presented in Appendix C. The model is conservative because the dilution of PCBs after entering the saturated zone and the degradation of PCBs in the vadose zone are not considered. The back-calculated site-specific soil screening levels for preventing PCB concentrations in groundwater from exceeding the MCL, ranging from 3×10^{20} to 7×10^{28} mg/kg (Worksheet C-11 in Appendix C), are significantly higher than the total PCB concentrations detected in soil at the Site (Appendix A).

Because crushed concrete containing PCBs may be re-used as on-site fill materials within the upper 15 feet of the vadose zone, a second set of site-specific screening levels for the protection of groundwater were also estimated for total PCBs in concrete. These screening levels were calculated using the reverse calculation method described above with one modification: hydrogeologic parameters and Van Genuchten's model parameters for sand (approximating the properties for crushed concrete) were used in place of the same parameters estimated for the first 15 feet of soil (based on the logs of borings 125 and 126). As presented in Appendix C, the resulting site-specific screening level for crushed concrete, $8x10^{28}$ mg/kg, was similar in magnitude to the site-specific screening levels for vadose zone soil. This maximum allowable concentration of PCBs in crushed concrete is significantly higher than the total PCB concentrations detected in concrete at the Site (Appendix A).

5.0 REMEDIATION OBJECTIVES AND SCENARIOS FOR FS EVALUATION

Based on the results of the screening risk assessment [NCP 40 CFR 300.430(d)(4)], this section describes the RAOs, COCs developed from COPCs, site-specific risk-based and other remediation goals (referred to herein as site-specific remediation goals) for the COCs, and areas of the Site where the COC concentrations in soil, soil vapor, and concrete are above the site-specific remediation goals.

5.1 REMEDIAL ACTION OBJECTIVES

RAOs are general risk management goals for protecting human health and the environment. The RAOs for the Site are listed below.

- Mitigate shallow soil vapor impacted with COCs above site-specific remediation goals established for future Site use for the protection of commercial/industrial workers occupying buildings that may be affected by vapor intrusion.
- Mitigate shallow soil impacted with COCs above the site-specific remediation goals established for future Site use of soils to a depth of 15 feet for the protection of power plant construction workers.
- Mitigate PCB-impacted concrete for the protection of human health.
- Mitigate deeper soils impacted with COCs for protection of groundwater.

To meet the RAOs for the Site, site-specific remediation goals were established, and COC-impacted areas were identified as discussed in the following sections.

5.2 SITE-SPECIFIC REMEDIATION GOALS

Based on the results of the screening-level HHRA for chemicals present in soil and soil vapor in the upper 15 feet of the vadose zone (evaluating potential indoor air and direct contact exposures) and an evaluation of the potential impacts to groundwater, several COCs were identified in the soil and soil vapor that would require mitigation. In shallow soil (upper 15 feet of the vadose zone), arsenic and PCBs in soil were identified as contributing significantly to potential risk or hazards in certain Phase areas of the Site and were identified as COCs. PCBs were also identified as COCs in concrete building slabs for the proposed reuse of the crushed concrete as fill material in the upper 15 feet of the vadose zone. A summary of the COCs requiring mitigation are described in the subsections below.

5.2.1 Indoor Air Exposure

Chloroform, PCE, and TCE in shallow soil vapor (5 and 15 feet bgs) in the Phase I area contributed significantly to potential risk or hazards for future indoor commercial/industrial workers. These VOCs did not pose a significant cancer risk or noncancer hazard for future outdoor workers (outdoor commercial/industrial workers or construction workers). Under the proposed power plant redevelopment plan, indoor exposures are considered incomplete as office buildings are not proposed for the Phase I area or within 100 feet from where these COPCs were detected. These COPCs were therefore only identified as COCs for potential indoor inhalation exposures under alternative future commercial/industrial use. Shallow soil vapor remediation goals were established for these three COCs to mitigate potential exposures to a future indoor commercial/industrial worker (applicable to soil vapor within 15 feet bgs). Using the carcinogenic RBSLs protective of a 10^{-6} risk of indoor commercial/industrial worker exposure (1.4 µg/L, 1.6 µg/L, and 4.4 µg/L for chloroform, PCE, and TCE, respectively [Table 2]), remediation goals were derived protective of one-in-one hundred thousand (10^{-5}) risk from cumulative exposure to these VOCs (4.7 µg/L, 5.3 µg/L, and 14.7 µg/L, respectively). As future use at the Site will be commercial/industrial (versus residential), a cumulative target cancer risk level of 10^{-5} was proposed. This target risk level is the mid-point of the risk management range recommended by U.S. EPA (10^{-6} to 10^{-4}), and is the risk level at or above which notification is required under the Proposition 65 and Air Toxic Hot Spots programs in California (OEHHA, 2001, 2003, and 2004). In addition, 10^{-5} is commonly used at the target risk level for commercial/industrial sites overseen by the DTSC.

Remediation goals were also derived for chloroform, PCE, and TCE in shallow soil vapor using the noncarcinogenic RBSLs protective of a chemical-specific, noncancer HQ of 1 (800 µg/L, 120 µg/L, and 1900 µg/L for chloroform, PCE, and TCE respectively [Table 2]). These remediation goals were derived protective of a cumulative HI of 1 (267 µg/L, 40 µg/L, and 633 µg/L for chloroform, PCE, and TCE respectively). As the remediation goals derived from the carcinogenic RBSLs are universally more conservative, these values were established as the final remediation goals for these VOCs under alternative future commercial/industrial use (i.e., commercial/industrial use other than the proposed power plant) as summarized in Table 16A. Chloroform, PCE, and TCE are at concentrations in shallow soil vapor that exceed these remediation goals at the northern portion of Buildings 106, 108, and 112 (Figure 10).

5.2.2 Direct Contact Exposure

Site-specific remediation goals were established for PCBs and arsenic in shallow soil (0 to 15 feet bgs) to mitigate potential direct contact exposures to future workers. Specifically, remediation goals were developed to mitigate potential exposures to construction workers involved with the redevelopment of the Site as well as to workers under future use of the Site as a power plant or some commercial/industrial alternative. As presented in Tables 3 through 7, the predicted cancer risks for outdoor commercial/industrial worker exposure to the carcinogenic PCBs detected in soil (Aroclor-1232, -1248, -1254, and -1260) are greater than the predicted risks for construction worker exposure to these compounds. Therefore, soil remediation to mitigate potential outdoor commercial/industrial worker exposure to carcinogenic PCBs would also mitigate potential construction worker exposure. However, the potential exposure to future outdoor commercial/industrial workers would only occur if PCB-contaminated soil is redistributed and left exposed at the land surface following Site redevelopment (Section 4.1.1). As a result, two remediation goals for PCBs in soil were developed, one for soil that may be left exposed at the surface following Site redevelopment (protective of both potential outdoor commercial/ industrial worker exposure and construction worker exposure) and one for soil to be left below pavement or other ground cover that only construction workers may come into contact with during redevelopment (i.e., during excavation, grading). These two remediation goals are described below.

- For soil that may be left exposed at the surface, a total PCB concentration of 7.4 mg/kg was set as the soil remediation goal for PCBs at a 10^{-5} risk level (Table 16B). This goal is based on the carcinogenic RBSL of 0.74 mg/kg, which was developed for outdoor commercial/industrial worker exposure to PCBs in soil at a 10^{-6} risk level (Table 1).

- For soil to be left unexposed (e.g., below pavement), a total PCB concentration of 76 mg/kg was set as the soil remediation goal at a 10^{-5} risk level (Table 16B). This goal is based on the carcinogenic RBSL of 7.6 mg/kg, which was developed for construction worker exposure to PCBs in soil at a 10^{-6} risk level (Table 1).

These remediation goals are consistent with the remediation goals established for commercial/ industrial worker exposures to COCs in soil vapor that are also protective of a cumulative target cancer risk level of 10^{-5}. The noncarcinogenic RBSL developed for construction worker exposure to Aroclor-1254, 4.4 mg/kg (Table 1), was set as an additional soil remediation goal specifically for this PCB that is protective of a chemical-specific, noncancer HQ of 1. Given the relative magnitude of the construction worker RBSL to the outdoor commercial/industrial worker RBSL (4.4 mg/kg versus 11 mg/kg, respectively) (Table 1), mitigation of noncancer hazards to construction workers from exposure to Aroclor-1254 would also mitigate noncancer hazards to outdoor commercial/industrial workers. Finally, the carcinogenic RBSL of 7.6 mg/kg was set as the remediation goal for potential construction worker exposure to total PCBs in concrete protective of a 10^{-6} risk. The more conservative target cancer risk was used as a basis for this remediation goal to meet the waste criteria for concrete containing PCBs [i.e. less than 50 mg/kg, as defined in 40 CFR Section 761.61(a)(4)(i)(A)]. The remediation goals for PCBs are summarized in Table 16B.

For arsenic, a remediation goal corresponding to the background concentration of 10 mg/kg established for a nearby property (City of Vernon H&EC, 2008) was used to mitigate potential outdoor commercial/industrial worker and construction worker exposures to this COC (Table 16B). This local background concentration is consistent with the range of background concentrations of arsenic in California soils documented by Bradford et al. (1996) (0.6 to 11 mg/kg). Although these background concentrations, for the most part, are above the carcinogenic RBSLs for outdoor commercial/industrial workers and construction workers (0.24 and 2.0 mg/kg, respectively), remediation of soil to levels below background is not typically required by U.S. EPA (U.S. EPA, 2004).

The specific areas where arsenic and/or PCBs in soil are at concentrations that exceed the remediation goals established for the Site in the upper 15 feet of the vadose zone are as follows (Figure 10).

- Phase I Area - PCBs in soil/gravel fill adjacent to a former transformer located outside of Building 106 (along the east side of the building).

- Phase II Area – PCBs in soil near the location of the saw and near the former buried vertical pit.

- Phase IIIa Area – arsenic in soil near the location of the cooling tower hot well arsenic in soil near storm water outfall #6, and PCBs (Aroclor 1254) in soil at north end of the former waste disposal pit.

- Phase IV Area – PCBs in soil near the former tube mill and roll stretcher machine area and arsenic in soil near the former scalper/planer machine area and former tube mill Stoddard solvent dip tanks and vault area.

- Phase VI Area – arsenic in surface soil near the buried rail line.

5.2.3 Potential Impacts to Groundwater

Several VOCs in soil in the Phase I area, specifically TCE, PCE, 1,2-DCA, benzene, and toluene, were identified as exceeding site-specific soil screening levels for the protection of groundwater as described in Section 4.3.1. All of these COPCs were subsequently identified as COCs, and the site-specific soil screening levels for these compounds were established as remediation goals to mitigate a potential future risk to groundwater. A summary of the remediation goals is provided in Table 16C. The specific depths where the identified VOCs are at concentrations in the Phase I area that exceed the remediation goals are as follows (Figure 10):

- TCE and PCE detected at depths between 21.5 and 136 feet bgs in soil in northern portion of Buildings 106, 108, and 112.

- Benzene and toluene detected at depths between 50.5 and 140 feet bgs in soil in the southern portion of Building 106.1,2-DCA detected at depths between 50.5 and 80.5 feet bgs in soil in the southern portion of Building 106.

5.2.4 Summary of Site-specific Remediation Goals

As described in Sections 5.2.1 through 5.2.3 above, various site-specific remediation goals were established for COCs in soil, concrete, and soil vapor at the Site under various future land use scenarios. In summary, the site-specific remediation goals established for such scenarios are as follows:

Remediation Goals Established for COCs in Soil and Concrete – relevant for all future commercial/industrial use scenarios, including the proposed power plant development:

1. PCBs in Shallow Soil (0 to 15 feet bgs)
    a. Aroclor-1254 – **4.4 mg/kg**
    b. Total PCBs – **7.4 mg/kg** for soil that may be left exposed at the surface following redevelopment; **76 mg/kg** for soil to be left below pavement or other ground cover that only construction workers may come into contact with during redevelopment
2. PCBs in Concrete
    a. Total PCBs – **7.6 mg/kg**
3. Metals in Shallow Soil (0 to 15 feet bgs)
    a. Arsenic – **10 mg/kg**
4. VOCs in Shallow and Deeper Soil (0 foot bgs to groundwater, ~150 feet bgs) – depth-specific remediation goals for TCE, PCE, benzene, toluene, and 1,2-DCA are presented in Table 16C.

Remediation Goals Established for COCs in Shallow Soil Vapor (5 and 15 feet bgs) – relevant for future commercial/industrial use scenarios excluding the proposed power plant development:

a. Chloroform – **4.7 μg/L**

b. PCE – **5.3 μg/L**

c. TCE – **14.7 μg/L**

These site-specific remediation goals are also summarized in Tables 16A through 16C, with explanations provided for how each value was established. Boring or sample locations with matrix sample concentrations above the site-specific remediation goals are shown on Figure 10.

5.3 AREAS WITH COC-IMPACTED SOIL ABOVE THE REMEDIATION GOALS

Based on previous investigation data and screening risk assessment findings, the following areas within each Phase area were identified with COC-impacted soils having concentrations greater than the applicable site-specific remediation goals described in Section 5.2. These areas will need to be addressed as part of Site redevelopment and closure. The approximate dimensions and in-place soil volumes for each of the areas summarized below are shown on Figure 11.

Phase I Area:

- Area 1: Northeast portion of former Building 112 where soil is impacted with TCE at concentrations above the site-specific remediation goal for the future protection of groundwater.
- Area 2: Southern portion of former Building 106 where soil is impacted with benzene, 1,2-DCA and TCE at concentrations above the site-specific remediation goals for the future protection of groundwater.
- Area 3: Northwest corner of the Site (former Buildings 106 and 108) where soil, soil vapor, and groundwater are impacted with TCE (and other VOCs). TCE and PCE concentrations in soil are above site-specific remediation goals for the future protection of groundwater. Chloroform, TCE, and PCE are above site-specific remediation goals for potential commercial/industrial indoor air exposure (relevant only for alternative future commercial/industrial use if the power plant is not developed as proposed).
- Area 8: West of Building 106 were soil/gravel are impacted with PCBs at concentrations above the site-specific remediation goals for the protection of future commercial/industrial workers.

Phase II Area:

- Area 4 and 4a: West-central portion of former Building 104 (around the former vertical pit) where soil is impacted with PCBs at concentrations above the site-specific remediation goals for the protection of future construction workers and commercial/industrial workers.
- Area 5 and 5a: Southern portion of former Building 104 (near the saw location) where soil is impacted with PCBs at concentrations above the site-specific remediation goals for the protection of future construction workers and commercial/industrial workers.

Phase IIIa Area:

- Area 6: North side of cooling tower hot well area where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal).

- Area 7: Storm water outfall #6 area where soil is impacted with arsenic and at the north end of the former inert waste disposal pit where soil is impacted with PCBs (Aroclor 1254). The concentration of arsenic is above the site-specific background level for this metal (i.e., the remediation goal). The concentration of Aroclor-1254 is above the site-specific remediation goal for the protection of future potential construction workers.

Phase IV Area:

- Area 9: Area east of scalper and planer machines where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal).

- Area 10: Area in the southeast corner of the former tube mill Stoddard solvent dip tanks and vault where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal).

- Area 11: Area in the northern portion of the former tube mill and roll stretcher machines where soil is impacted with PCBs at concentrations above the site-specific remediation goals for the future protection of construction workers and commercial/industrial workers.

Phase VI Area:

- Area 12: Southern portion of Parcel 7 (near the southern buried railroad tracks) where soil is impacted with arsenic at a concentration above the site-specific background level for this metal (i.e., the remediation goal).

The remediation scenarios include addressing surface/shallow COC-impacted soils and deeper VOC- and PCB-impacted soils and will be evaluated further in this FS. A detailed evaluation of soil management of shallow COC-impacted areas that will be encountered during below-grade demolition along with excavation and off-site soil disposal is provided in the RAP in Section 9.0.

5.4 AREAS WITH PCB-IMPACTED CONCRETE

PCB-impacted concrete areas exceeding the site-specific remediation goal of 7.6 mg/kg for total PCBs were identified and are shown on Figure 8. Areas of PCB-impacted concrete were found in Buildings 104, 106, 108, and 110, with smaller areas of impacts in Buildings 112 and 112A.

5.5 GENERAL RESPONSE ACTIONS

GRAs are general categories of action that, when implemented, will meet the RAOs for the Site (U.S. EPA, 1988). Combinations of GRAs could be used to meet the RAOs if needed. Five GRAs that may be applicable to address soil and concrete impacts in this case are summarized below.

- No Action [NCP 40 CFR 300.430(e)(6)]: the CERCLA FS process requires a "no action" alternative to provide a basis of comparison with other remedial actions. All ongoing activities would cease under this response. Natural attenuation, degradation, dispersion, adsorption, dilution, and volatilization are the only processes that would take place and will occur regardless of intervention.

- Institutional controls: institutional controls are typically implemented as a site-management alternative using tools such as deed covenants, water-use restrictions, land-use restrictions, and/or the monitoring of a site condition to prevent unintended use of the site or groundwater. Institutional controls are appropriate for site management when risk to human health or the environment as a result of existing environmental conditions is low or easily managed. Institutional controls may also be used as a component of a more extensive or comprehensive remediation program when full restoration of site conditions is not needed for the intended land and groundwater use.

- Containment: containment can be used to control the migration or mobilization of COCs. A containment technology under consideration is capping, which would provide dermal contact barriers between receptors and the soil impacted with COCs and could also reduce or limit infiltration and leaching to groundwater. Specific capping remedies may include a sub-slab vapor-barrier component, depending upon COC type and future site use.

- Ex situ treatment: ex situ treatment involves excavating and removing soil or other materials impacted with COCs. Impacted soil can be treated on-site by technologies such as thermal desorption, aeration, landfarming, or bioremediation and reused as backfill after treatment is complete. Impacted soil can also either be treated and/or disposed off-site at a landfill. An additional COC-impacted media at the Site includes concrete slabs known to be impacted with PCBs. Remedial options for PCB-impacted concrete include ex situ treatment technology evaluations as described in Sections 6.0 and 7.0.

- In situ treatment: in situ treatments immobilize, destroy, break down, or remove COCs from the impacted soil. In situ treatment involves the application of biological, chemical, or physical processes that reduce toxicity, mobility, and/or mass of COCs. Possible in situ treatment technologies include: bioremediation, bioventing, SVE, in situ thermal desorption, and solidification/stabilization.

5.6 PRELIMINARY ARARS EVALUATION

The following section presents an overview of the applicable or relevant and appropriate requirements (ARARs) process and identifies ARARs affecting the RAOs. ARARs are site-specific requirements and involve a two-part analysis: first, an evaluation of whether a given requirement is applicable; then if it is not applicable, whether it is nevertheless relevant and appropriate. As further discussed below a component of the remedy selection process is whether it meets ARARs.

Applicable requirements are those remediation standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal, state, and local law that specifically address the situation at a CERCLA site. The requirement is applicable if the jurisdictional prerequisites of the standard show a direct correspondence when objectively compared to the conditions at the site. If the requirement is not legally applicable, then the requirement is evaluated to determine whether it is relevant and appropriate (U.S.EPA, 1988).

Relevant and appropriate requirements are those remediation standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law, that while not applicable, address problems or situations sufficiently similar to the circumstances of the proposed response action and are well suited to the conditions of the site (U.S. EPA, 1988).

A requirement must be substantive in order to constitute an ARAR for activities conducted on-site. Procedural or administrative requirements such as permits and reporting requirements are not ARARs. In addition to ARARs, the NCP suggests that lead and support agencies may identify other agency advisories, criteria, or guidance “to-be-considered” (TBC) for a particular release. The TBC category consists of advisories, criteria, or guidance that were developed by U.S. EPA, other federal agencies, or states that may be useful in developing CERCLA remedies [NCP 40 CFR 300.400(g)(3)]. These provisions are, however, only useful in developing remedial action alternatives and are not promulgated federal or state ARARs (U.S. EPA, 1988). Requirements of ARARs and TBCs are generally divided into three categories: chemical-specific, location-specific, and action-specific.

6.0 IDENTIFICATION AND SCREENING OF TECHNOLOGIES

This section describes the screening criteria and evaluation of potential remedial technologies to address the COCs identified in this FS. This section also presents the results of the remedial action technology screening process for soil, soil vapor, and concrete at the Site.

6.1 SCREENING CRITERIA

As specified in the NCP 40 CFR 300.430(e)(7)(i),(ii),(iii), remedial technologies are initially screened according to the criteria of effectiveness, implementability, and cost. The objective of this section is to develop a range of potential remedial technologies that can be further evaluated as required by the NCP guidelines. A detailed evaluation is performed on these remedial action alternatives in Section 7.1, and the proposed preferred remedial alternative is recommended for implementation at the Site in Section 8.0. A proposed RAP is included as Section 9.0 and a public participation program is included in Section 10.0.

6.1.1 Effectiveness

Effectiveness is evaluated based on how well a technology meets the RAOs, protects human health and the environment in the short and long term; attains federal and state ARARs; significantly and permanently reduces the toxicity, mobility, or volume of hazardous constituents; and is technically feasible and reliable.

6.1.2 Implementability

Implementability is evaluated based on the technical feasibility and availability of a technology, the technical and institutional ability to monitor and maintain a technology, and the administrative feasibility of implementing the technology. Implementability criteria also consider useable Site space or area and schedule constraints as related to implementation of certain technologies, either prior to or in conjunction with proposed future Site use.

6.1.3 Cost

The cost is the total cost of the remedy and is evaluated as the net present value. At the screening stage, a high level of accuracy in estimating costs is not required. CERCLA guidance indicates that an accuracy of -30 percent to +50 percent is acceptable.

6.2 EVALUATION PROCESS

The technology screening evaluation process begins by developing a list of applicable technologies for addressing COC impacts at the Site. Many of the remedial technologies initially identified for consideration at VOC-, metals-, and PCB-impacted areas were presumptive remedies. “Presumptive remedies are preferred technologies for common categories of sites, based on historical patterns of remedy selection and U.S. EPA’s scientific and engineering evaluation of actual performance data on technology implementation” (U.S. EPA, 1993). The objective of using presumptive remedies is to simplify or speed up the selection of a remedial action by eliminating the initial step of identifying and screening a broad variety of alternatives.

The presumptive remedy approach involves selecting remedies that have already been proven to be both feasible and cost-effective for specific site types and/or COCs. Presumptive remedies help promote consistency in remedy selection, improve the predictability of the remedy selection process, and are presumed to be NCP compliant (New York State, 2007).

After assessing those technologies with the greatest potential to meet the site-specific remediation goals identified in Section 5.1, each of these remedial technologies was evaluated based on the screening criteria described in Section 6.1. The evaluation process consisted of the following steps.

1. Evaluate the effectiveness of each technology. If a technology is considered effective, retain it for an evaluation of implementability; otherwise eliminate the technology from further consideration.

2. Evaluate the implementability of the remaining technologies. If a technology is considered implementable, retain it for an evaluation of cost-effectiveness; otherwise eliminate the technology from further consideration.

3. Evaluate the cost-effectiveness of the remaining technologies. If a technology is considered cost-effective, retain it for possible incorporation in a remedial alternative; otherwise eliminate the technology from further consideration.

The results of the remedial technologies screening for soil, soil vapor, and concrete in Sections 6.3 and 6.4 are summarized in Tables 17 and 18, respectively. Only those technologies that met all three screening criteria are carried through into the detailed evaluation of remedial action alternatives in Section 7.0.

6.3 SOIL TREATMENT TECHNOLOGY SCREENING

The following sections provide a description of the remedial technologies that were initially screened to address the surface/shallow COC-impacted soil and deeper VOC-impacted soil at the Site. As shown on Table 17, each technology is either retained or eliminated based on the COC and screening criteria established in Section 6.1 as required pursuant to NCP 40CFR 300.430 (e)(7)(i)(ii)(iii).

6.3.1 No Action

A "No Action" alternative is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and is retained for comparative purposes. With this alternative, no active remedial action would be implemented at the Site. This alternative would not meet RAOs for the Site, nor would it result in a reduction of mobility, toxicity, or volume of known wastes. The Site would remain in its present state, and there would be no cost associated with this alternative. Naturally occurring processes such as attenuation, degradation, dispersion, adsorption, dilution, and volatilization may result in decreases in COC concentrations depending on the subsurface soil conditions. Pursuant to NCP 40 CFR 300.430(e)(6), this alternative is retained for comparative purposes only.

6.3.2 Institutional Controls

All of the remedial action alternatives evaluated for the Site, except the No Action alternative, will include some form of institutional controls. These controls include a variety of measures designed to prevent current and future property owners and operators from taking actions that would expose workers or other potential receptors to unacceptable risk, interfere with the effectiveness of the final remedy, convert the Site to an end use that is not consistent with the level of remediation, and/or allow residual COCs to migrate off-site.

Institutional controls include deed covenants, land use and groundwater use restrictions, and zoning controls that may be applicable for the surface/shallow COC-impacted soil and deeper PCB-impacted and VOC-impacted soil remediation scenarios described in this FS. Applying the remediation goal (76 mg/kg) for PCBs in soil, remaining soil containing PCBs at concentrations greater than 25 mg/kg and less than 76 mg/kg could be left behind in low-occupancy [as defined in 40 CFR Section 761.61(a)(4)(i)(B)(3)] areas with capping, signage, and deed covenants. Implementation of institutional controls requires agreement between all parties affected or requires agreement between landowner/responsible party and regulatory agency.

The use of institutional controls as a stand-alone alternative does not meet the RAOs for the Site. However, regardless of the remedial alternative selected and implemented, it is assumed that the Site will always function under some form of institutional controls that dictate a commercial/industrial land use and that identify the uppermost groundwater as not potable. As this assumption would be included with each alternative, institutional controls will not be independently evaluated further or included in subsequent remedial alternative evaluations.

6.3.3 Containment

Engineered barriers, such as a surface cap, were considered as a GRA for the shallow COC-impacted soil and deeper VOC-impacted soil. The design of engineered capping barriers is site-specific and depends on the intended functions of the system and the intended future Site use. Barriers can range from a one-layer system of vegetated soil to a complex multi-layer system of soils, geosynthetics, and/or pavements. The materials used in the construction of barriers include low-permeability and high-permeability soils, low-permeability geosynthetic products, aggregate base, asphalt, concrete, or other surface cover materials.

Capping consists of constructing a low-permeability cover or cap system that minimizes contact exposure to receptors from impacted soil and may reduce potential infiltration of surface run-off. Vapor barriers create a vapor migration barrier using a combination of low-permeability materials including synthetic liners to inhibit VOC-vapor intrusion into buildings or other structures. A vapor barrier can be a component of a capping remedy at redeveloped sites that may contain newly constructed buildings. Vapor barriers can include subslab venting which involves venting soil vapor beneath building foundation slabs as a means of protecting building occupants from subsurface vapor migration.

Capping and vapor barriers are not retained for further evaluation for shallow COC-impacted soil and deeper VOC-impacted soil. Moreover, the existing concrete slabs at the Site could be considered as a cap or barrier to prevent dermal contact with underlying soils, reduce infiltration, and limit volatile emissions. However, the presence of the existing concrete slabs at or above-grade level at the Site prevents future redevelopment construction activities in the subgrade. Therefore the existing concrete slabs must be removed and the underlying soil impacts must be addressed. While permanently leaving the existing slabs and pavements in-place could be considered containment, it also represents a form of No Action, does not result in the removal of underlying foundations and footings, and therefore does not meet the RAOs for the Site. Specific details regarding future Site use are undefined, and capping with vapor barriers, if necessary, would be a design component of the proposed future development. Redevelopment structures such as these are not considered or evaluated in this document.

6.3.4 Ex Situ Treatment

Removal of impacted soils is a widely proven GRA. Removal technologies for soil typically refer to excavation followed by on-site treatment, off-site treatment, or disposal. Examples of on-site treatment technologies include low temperature thermal desorption (recycling), stabilization, aeration, and on-site landfarming or bioremediation. Off-site treatment includes landfill disposal, which may also include treatment such as low temperature thermal desorption, or stabilization, prior to landfilling.

Excavation/removal of impacted soils with off-site landfill disposal is retained for further consideration for surface/shallow COC-impacted soil. No post-excavation on-site treatment technologies were retained due to soil management controls or other requirements that would be necessary to effectively perform on-site treatment. These additional components include run-on and run-off controls for storm water management, potential bottom liners under soil stockpiles, control of dust and odor emissions, perimeter air monitoring, potential Air Quality Management District (AQMD) permitting issues, and on-going operations and maintenance requirements. Construction costs associated with implementation of these additional controls will generally negate or off-set any potential cost savings that might typically be associated with on-site treatment technologies. Although off-site treatment and disposal of COC-impacted soil was retained for further evaluation, this would only be a viable option if the impacted soil is acceptable to a receiving facility. PCB- and metals-impacted soils could be landfilled, while VOC-impacted soils could either be landfilled or recycled via thermal desorption.

6.3.5 In Situ Treatment

In situ treatment technologies considered for further evaluation include bioremediation and thermal desorption for organic COC-impacted soils, stabilization for all COC-impacted soils, and SVE for VOC-impacted soil. Of the in situ treatment technologies evaluated for COC-impacted soil, SVE was retained for further consideration for both shallow and deep VOC-impacted soils. SVE is considered a presumptive remedy for VOC-impacted soils. Thermal desorption was not retained because it is ineffective on metals-impacted soil or in shallow soil applications less than 6 feet bgs. Thermal desorption is also relatively more expensive when compared to SVE for treatment of VOC-impacted soil. SVE is effective for VOCs present at the Site and could be implemented under current Site conditions; if successful, SVE would meet the RAOs.

Stabilization is also a viable remedial technology for PCB- and metals-impacted soils and is also retained for further consideration. Stabilization has previously been performed at other remediation sites within the City of Vernon. Typically a bench-scale mix design is required to determine the most effective stabilization admixture and corresponding percentage of additive necessary to meet stabilization objectives. Previous case studies suggest PCBs are amenable to stabilization/solidification technologies with simple cement-based additives, although a bench-scale mix study would be required to determine site-specific feasibility and an appropriate mix design prior to any field implementation.

6.4 PCB-IMPACTED CONCRETE TREATMENT TECHNOLOGY SCREENING

The following sections provide a description of the remedial technologies considered to address the PCB-impacted concrete. As shown on Table 18, each technology is either retained or eliminated based on the screening criteria established in Section 6.1.

6.4.1 No Action

A "No Action" alternative is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) guidance and is retained for comparative purposes. With this alternative, no active remedial action would be implemented at the Site. This alternative would not meet RAOs for the Site, nor would it provide a reduction of mobility, toxicity, or volume of known wastes. The Site would remain in its present state, and there would be no cost associated with this alternative. Pursuant to NCP 40CFR 300.130 (e)(6), this alternative is retained for comparative purposes only.

6.4.2 Institutional Controls

All of the remedial action alternatives evaluated for the Site, except the No Action alternative, will include some form of institutional controls. These controls include a variety of measures designed to prevent current and future property owners and operators from taking actions that would expose workers or other potential receptors to unacceptable risk, interfere with the effectiveness of the final remedy, convert the Site to an end use that is not consistent with the level of remediation, and/or allow residual impacts to migrate off-site.

Institutional controls can include deed covenants, land use and groundwater use restrictions, and zoning controls that may be applicable for the PCB-impacted concrete described in this FS. The implementation of institutional controls requires agreement between landowner/ responsible party and regulatory agency. Federal Toxic Substances Control Act regulations (CFR 761.61) require specific institutional controls regarding surface capping, signage, and low- versus high-occupancy Site use, depending on the concentrations of remaining PCBs in concrete. Applying the remediation goal (7.6 mg/kg) for PCBs in concrete, concrete containing PCBs at concentrations less than 7.6 mg/kg could be reused in all areas of the Site, including high-occupancy [as defined in 40 CFR Section 761.61(a)(4)(i)(A)]) areas that are capped. Regardless of the remedial alternative selected and implemented, it is assumed that the Site will be redeveloped and will include a commercial/industrial land use. As this assumption would be included with each alternative, institutional controls as a stand-alone alternative do not meet the RAOs for the Site and will not be evaluated further or included in subsequent remedial alternative evaluations.

6.4.3 Ex Situ Treatment

Ex situ treatment technologies that were considered for PCB-impacted concrete include demolition and disposal. The areas of known PCB impacts are shown on Figure 8. Demolition and disposal involves saw-cutting and removing PCB-impacted concrete followed by transportation to an appropriate off-site disposal facility. Demolition and disposal is retained for further consideration for addressing of PCB-impacted concrete present in former building slab areas.

6.4.4 In Situ Treatment

In situ treatment technologies that were considered for PCB-impacted concrete include surficial scarification, encapsulation of intact surface slab areas, and decontamination via steam cleaning.

Scarification is an effective treatment for removal of relatively thin surficial layers of concrete. Scarification is performed with grinding equipment that removes concrete layers in thicknesses equivalent to fractions of an inch, while generating noise and dust. Concrete dust associated with scarification would require collection and disposal. Depending on the desired depth of scarification, multiple passes of grinding equipment may be necessary. Additional confirmation sampling would then be necessary. This technology is generally not cost effective if removal depths exceed several inches. Coring data obtained from several areas within Buildings 104, 106, 108, and 112 indicate multiple layers of concrete are present, some with PCB-impacted lower layers overlaid by 2.5 to 4 inches of clean concrete. Scarification is not an effective treatment for this type of alternately impacted multi-layered concrete and is therefore not retained for further consideration.

Encapsulation or sealing of impacted concrete slab areas involves physically microencapsulating wastes by sealing them with an applied compound. Encapsulation is typically performed with polymers, resins, or other proprietary binding and sealing compounds that are bonded to the impacted surface. Surface encapsulation effectiveness is limited to the success of the adhesive bond between the coating and the waste (U.S. EPA, 1982). Long term inspection and monitoring is also required to maintain integrity of the sealed areas. Encapsulation is not retained for further evaluation because bench-scale testing of multiple surface sealant compounds would need to be performed to determine the effectiveness of this alternative. Furthermore surface encapsulation would require the slab areas to be left in place. This would not allow demolition of existing below-grade foundations and footings that are being removed as a component of the Site remediation.

Steam cleaning or pressure washing is typically used to remove surficial impacts to both porous and non-porous surfaces. Steam cleaning or pressure washing is most effective on non-porous surfaces such as steel and less effective on porous or deeply impregnated stains. Steam cleaning or pressure washing would be performed as a decontamination step prior to slab demolition. Pressure-washing and steam cleaning of building slabs was performed as a general remediation technique prior to building demolition at the Site to remove surface accumulations of dust and oils. Post-demolition concrete coring and analytical testing in areas that were recently steam cleaned during above-ground demolition still contained areas where PCBs were detected above site-specific remediation goals. This demonstrates that steam cleaning is not an effective treatment technique for removing PCB impacts or heavily stained surfaces in porous concrete. Furthermore, steam cleaning is not an effective treatment because of the depth of penetration of the PCBs into the concrete slabs, and the presence of alternately contaminated multi-layered concrete slabs. Steam cleaning and pressure washing are not retained for further consideration.

7.0 DETAILED EVALUATION OF REMEDIAL ALTERNATIVES

Section 6.0 screened the available technologies within each of the retained GRA categories, and identified the following remedial alternatives for additional detailed evaluation.

- No action;

- Excavation/removal followed by landfill disposal for surface/shallow COC-impacted soil and deep VOC-impacted soil;
- In situ stabilization of shallow COC-impacted metals, and PCB-impacted soil;
- SVE for shallow and deep VOC-impacted soil; and
- Demolition and disposal of PCB-impacted concrete.

These technologies are combined into potential alternatives for addressing COC-impacted areas at the Site and are further evaluated in Section 7.2 and summarized on Table 19.

7.1 EVALUATION CRITERIA

The detailed evaluation process comprises the development and scoping of remedial alternatives to provide a basis for comparison using additional, more detailed criteria, referred to as balancing criteria, than those initially applied in the screening steps of the FS process. The balancing criteria include those developed by the U.S. EPA in the NCP 40 CFR 300.430(a)(1)(iii) and site-specific criteria developed for this project. Of the nine U.S. EPA balancing criteria, seven are addressed in this FS. The remaining two, acceptance by supporting agencies (such as the RWQCB) and acceptance by the community, will be addressed when the supporting agencies and community have reviewed and commented on the FS report and Remedial Action Plan. These criteria are described in the following sections.

7.1.1 NCP-Based Evaluation Criteria

NCP-based evaluation criteria are described below.

- Short-term effectiveness [40 CFR 300.430(e)(9)(iii)(E)]: An evaluation of alternatives using this criterion will identify the short-term effectiveness of various alternatives during implementation. As appropriate, the following factors will be addressed: protection of the community, protection of workers, and potential environmental impacts.
- Long-term effectiveness [40 CFR 300.430(e)(9)(iii)(C)]: An evaluation of alternatives using this criterion will define the anticipated results of the RAO in terms of achieving the long-term RAO of COC mass removal and identify the conditions that may remain at the Site after the RAO has been met. Evaluation of the alternatives will also include factors such as treatment residuals.
- Implementability [40 CFR 300.430(e)(9)(iii)(F)]: An evaluation of alternatives using this criterion will identify the technical and administrative feasibility of implementing an alternative. Factors to be considered may include construction and operation, duration monitoring considerations, permits required, and availability of necessary services and materials.

- Overall protection of human health and the environment [40 CFR 300.430(e)(9)(iii)(A)]: An evaluation of alternatives using this criterion will identify how the alternative as a whole achieves, maintains, or supports protection of human health and the environment.

- Compliance with ARARs and implementing agency requirements [40 CFR 300.430(e)(9)(iii)(B)]: An evaluation of alternatives using this criterion will identify how the alternative complies with applicable federal/state/local requirements and guidelines.

- Reduction of toxicity, mobility, or volume through treatment [40 CFR 300.430(e)(9)(iii)(D)]: An evaluation of alternatives using this criterion will define the anticipated performance of the specific treatment technology. The evaluation would consider the amount of COC that will be treated, the degree of expected reduction in toxicity and mobility of the COC, the type and quantity of treatment residuals that will remain, and the degree to which the treatment will be irreversible.

- Cost [40 CFR 300.430(e)(9)(iii)(G)]: This assessment will evaluate the capital and operation and maintenance (O&M) costs of each alternative. The cost estimates will be assessed as capital cost, annual O&M cost, and present worth analysis.

7.1.2 Site-Specific Evaluation Criteria

Site-specific evaluation criteria are described below.

- Applicability based on Site conditions: An evaluation of alternatives using this criterion will identify the applicability of various alternatives relative to site-specific conditions such as hydrogeology, distribution of the COCs in soil and concrete, impacts on neighboring properties, access restrictions, future land use, and lease and legal issues.

- Time required for planning, design, permitting, construction, and operation: An evaluation of alternatives using this criterion will identify project-specific needs to conduct work within a period of time and identify the steps necessary to prepare for and accomplish that work.

- Integration with other project elements: An evaluation of alternatives using this criterion will identify the extent to which an alternative is integrated and consistent with other known project elements and activities.

7.2 DESCRIPTION AND EVALUATION OF REMEDIAL ALTERNATIVES

This section describes the remedial alternatives that were retained from the evaluation performed in Section 6.0 to address each remedial COC. These alternatives are described below. Each alternative is then evaluated against the NCP 40 CFR 300.430(e)(9)(iii) evaluation criteria presented in Section 7.1.1 and summarized in Table 19.

7.2.1 Alternative 1

No Action

Alternative 1 includes "No Action" and is included for evaluation pursuant to NCP 40 CFR 300.430(e)(6) and retained for comparison purposes. In this alternative, no below-grade demolition or subsequent soil remediation would be performed.

- **Overall Protection of Human Health and the Environment**
  No Action would not be protective of human health and the environment and would not meet the RAOs for the Site.

- **Compliance with ARARs**
  This alternative will not meet ARARs in a reasonable timeframe.

- **Long-Term Effectiveness**
  No Action would not achieve the RAOs for the Site.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**
  This alternative would provide limited reduction of toxicity, mobility, and volume with implementation.

- **Short-Term Effectiveness**
  No Action would never achieve the RAOs for the Site.

- **Implementability**
  There is no additional effort required for implementation of this alternative.

- **Costs**
  There are no costs associated with this alternative.

The Site will be redeveloped and this redevelopment will require below-grade demolition and soil remediation. In addition, the "No Action" alternative fails to meet the RAOs for the Site. "No Action" is not a viable alternative.

7.2.2 Alternative 2

Excavation and Disposal of COC-Impacted Soil and Demolition and Disposal of PCB-Impacted Concrete

Alternative 2 includes excavation and off-site landfill disposal of both shallow and deep COC-impacted soil (metals, PCBs, and VOCs) to depths of approximately 8 feet bgs for metals, 15 feet bgs for PCBs, and 45 feet bgs for VOCs. Excavation activities will require installation of shoring for sidewall stability and safety during soil removal. This alternative also includes demolition and landfill disposal of PCB-impacted concrete slab areas.

- **Overall Protection of Human Health and the Environment**
  This alternative would meet the RAOs of mitigating shallow COC-impacted soils and PCB-impacted concrete above the site-specific remediation goals for the Site. Excavation poses no overall element of risk to human health or the environment.

- **Compliance with ARARs**
  This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**
  This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete, and airborne dusts.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**
  This alternative would reduce the toxicity, mobility, and volume of COC-impacted soils and PCB-impacted concrete.

- **Short-Term Effectiveness**
  Risk to receptors and the environment is low if appropriate personal protective equipment (PPE) is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**
  The technologies in this alternative are reliable and effective. Impacted areas would need to be well defined, and implementation is relatively straightforward using commercially available equipment. Shoring or other stability controls are required during excavation.

- **Costs**
  Costs for this alternative were based on an excavation rate of 500 cubic yards per day and confirmation sample rate of one sample per 200 cubic yards of excavated material. Shoring costs are included in all proposed excavation areas greater than 10 feet bgs. Waste management costs associated with landfill disposal were estimated assuming that 90 percent of the waste is classified as a non-hazardous waste and 10 percent of the waste is classified as a hazardous waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. Estimated total capital cost for this alternative is $18,200,000 and summarized in Appendix D.

Excavation and disposal of all COC-impacted materials is a proven and reliable technology. Because of the required excavation depths, it is also relatively more expensive than other competing technologies.

7.2.3 Alternative 3

Excavation and Disposal of Shallow COC-Impacted Soil and SVE for Shallow and Deep VOC-Impacted Soil and Demolition and Disposal of PCB-Impacted Concrete

Alternative 3 includes excavation and off-site landfill disposal of shallow COC-impacted soil (PCBs and metals) to depths of approximately 15 feet bgs. Shallow and deep VOC-impacted soil would be addressed by SVE. This alternative also includes demolition and landfill disposal of PCB-impacted concrete slab areas. Non-PCB-impacted concrete would be crushed and reused as site fill material.

- **Overall Protection of Human Health and the Environment**
  This alternative would meet the RAOs of mitigating shallow COC-impacted soils and PCB-impacted concrete above the site-specific remediation goals for the Site. Excavation poses no overall element of risk to human health or the environment.

- **Compliance with ARARs**
  This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**
  This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete and airborne dusts. In addition, SVE is a presumptive remedy and can achieve site-specific remediation goals for VOC-impacted soils.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**
  This alternative would reduce the toxicity, mobility, and volume of COC-impacted soils and PCB-impacted concrete.

- **Short-Term Effectiveness**
  Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**
  The technologies in this alternative are presumptive remedies documented to be reliable and effective. Impacted areas would need to be well defined, and implementation is relatively straightforward using commercially available equipment and an effective monitoring program of the SVE system. Shoring or other stability controls are required during excavation. Necessary permits must be obtained for operation of the SVE system along with a monitoring and report program after system start-up.

- **Costs**
  Costs for this alternative were based on an excavation rate of 500 cubic yards per day and confirmation sample rate of one sample per 200 cubic yards of excavated material. Shoring costs are included in all proposed excavation areas greater than 10 feet bgs. Waste management costs associated with landfill disposal were

estimated assuming that 90 percent of the waste is classified as a non-hazardous waste and 10 percent of the waste is classified as a hazardous waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. SVE costs include rental of dual 300 cubic feet per minute (cfm) systems with continued operation over a three year period. Estimated total capital cost for this alternative is $2,500,000 and summarized in Appendix D.

Excavation and disposal of shallow COC-impacted materials, along with SVE for shallow and deep VOC-impacted soils, meets the RAOs for the Site and provides a balanced alternative that is both cost-effective and protective of human health and the environment.

7.2.4 Alternative 4

In Situ Stabilization of Shallow PCB/Metals-Impacted Soil, SVE for Shallow and Deep VOC-Impacted Soil and Demolition and Disposal of PCB-Impacted Concrete

Alternative 4 includes in situ stabilization of shallow PCB- and metals-impacted areas, with a cement-based additive to depths of approximately 15 feet bgs. Shallow and deep VOC-impacted soil would be addressed using SVE. This alternative also includes demolition and landfill disposal of PCB-impacted concrete slab areas.

- **Overall Protection of Human Health and the Environment**
  This alternative would not meet the RAOs of mitigating shallow and deep COC-impacted soils above the site-specific remediation goals because stabilization does not reduce the volume and may only partially reduce toxicity of COCs. PCB-impacted concrete and deeper COC-impacted soil RAOs for the Site would be met with this alternative. The technologies applied in this alternative pose no overall element of risk to human health or the environment.

- **Compliance with ARARs**
  This alternative would be protective of human health and environment and would be expected to meet ARARs.

- **Long-Term Effectiveness**
  This alternative would prevent human exposure by eliminating pathways between future receptors and soil, soil vapors, recycled concrete, and airborne dusts. In addition, SVE is a presumptive remedy and can achieve site-specific remediation goals for VOC-impacted soils.

- **Reduction of Toxicity, Mobility, and Volume through Treatment**
  This alternative would reduce the toxicity, mobility, and volume of deeper VOC-impacted soils and PCB-impacted concrete. Soil stabilization would reduce the mobility of shallow COC-impacted soils, but volume and toxicity would not be significantly reduced through treatment.

- **Short-Term Effectiveness**
  Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise, and odor controls are implemented.

- **Implementability**
  The technologies in this alternative are reliable and effective. Impacted areas would need to be well defined, but implementation of technologies is relatively straightforward. Soil stabilization requires a bench-scale test and mobilization of a large diameter crawler-mounted auger drilling rig. Necessary permits must be obtained for operation of the SVE system, along with a monitoring and report program after system start-up.

- **Costs**
  Costs for this alternative were based on a stabilization rate of 300 cubic yards per day, maximum stabilization depth of 50 feet bgs, and a stockpile confirmation sample rate of one sample per 200 cubic yards. Cement-mixing-additive assumed to be 10 percent of the stabilization material for cost estimation purposes. Cost assumes 20 percent of mixed volume requires off-site disposal. Waste management costs associated with landfill disposal were estimated assuming that 90 percent of the waste is classified as a non-hazardous waste and 10 percent of the waste is classified as a hazardous waste. Average thickness of the PCB-impacted concrete slabs was assumed to be 12 inches. SVE costs include rental of dual 300 cfm systems with continued operation over a three year period. Estimated total capital cost for this alternative is $2,800,000 and summarized in Appendix D.

SVE is a presumptive remedy that is well-suited to address the VOC-impacted areas on the Site.

8.0 PROPOSED PREFERRED REMEDIAL ALTERNATIVES

This section describes the proposed preferred remedial alternative selected to address the remedial COC scenarios evaluated through this FS process. Alternative 3 is the proposed preferred alternative. It includes excavation and landfill disposal of surface and shallow COC-impacted soil and SVE for shallow and deep VOC-impacted soil. PCB-impacted concrete in building slab areas will be mitigated using demolition and off-site disposal. It is the most cost-effective alternative that meets both the short-term and long-term effectiveness criteria. It also provides for a greater reduction of toxicity, mobility, and volume when compared to Alternative 4 and it is protective of human health and the environment and complies with most requirements of the City of Vernon H&EC.

8.1 DEMOLITION AND DISPOSAL OF PCB-IMPACTED CONCRETE

PCB-impacted concrete slab areas where concentrations exceed the proposed site-specific remediation goal of 7.6 mg/kg will be demarcated in the field by marking the slab surface.

PCB-impacted concrete slab areas will then be saw cut, removed, and transported off-site for disposal at an appropriate landfill facility permitted to accept PCB remediation waste.

8.2 EXCAVATION AND DISPOSAL OF SURFACE/SHALLOW COC-IMPACTED SOIL

The proposed preferred remedial technology for the surface/shallow COC-impacted soil is excavation and off-site disposal of soil containing PCBs, and metals concentrations exceeding site-specific remediation goals. Excavation activities will be followed by backfilling and compaction with crushed, recycled aggregates obtained from the on-site demolition and crushing of slabs and foundations as discussed in Section 9.0. In the event that additional fill is required, clean soil will be imported from off-site.

8.3 SVE FOR SHALLOW AND DEEP VOC-IMPACTED SOIL

The proposed preferred remedial technology for the shallow and deep VOC-impacted soil in the Phase I area is to install and operate an SVE system in the area where VOC concentrations exceed site-specific remediation goals. The SVE system will be operated until VOC concentrations in the effluent air stream reach asymptotic conditions. The system will then be shut-down to undergo vapor rebound testing, followed by additional operations as necessary. No soil confirmation sampling will be performed. System performance and termination of operations will be based on monitoring of in situ soil vapor concentrations obtained from soil vapor confirmation sampling performed after completion of vapor rebound testing. Although soil confirmation sampling will not be conducted to establish closure after treatment, soil samples may be collected and analyzed to document the remaining concentrations of the VOCs in soil for a deed covenant for the Site.

9.0 REMEDIAL ACTION PLAN

In the event that the City of Vernon H&EC and other necessary public agencies approve Alternative 3 of the FS, the RAP described below will be implemented. This RAP discusses the implementation of the proposed preferred remedial alternative for PCB-impacted concrete, surface/shallow COC-impacted soil, and deep VOC-impacted soil. The RAP also covers the materials management practices that will be implemented during excavation and removal of the impacted concrete and soils during below-grade demolition.

Remedial action of impacted concrete and soil will be conducted in conjunction with below-grade demolition activities that will include removal of man-made structures, building slabs, pavements, footings, foundations, pits, and sumps within the footprint of the existing buildings and other structures located adjacent to the building areas as described in the Below Grade Demolition Plan (Geomatrix, 2006b). Following completion of each remedial alternative, cumulative risk will be calculated to confirm specific ranges are not exceeded.

9.1 PROPOSED PREFERRED REMEDIAL ALTERNATIVE

Alternative 3 is the proposed preferred remedial alternative described in Section 7.2.3. Implementation of the remediation components associated with Alternative 3 is described below.

9.1.1 PCB-Impacted Concrete Remedial Action Implementation

The proposed preferred remedial approach for PCB-impacted concrete is demolition and disposal at a suitable landfill facility. This portion of the remedy will be implemented in conjunction with below-grade demolition of surface slabs and pavements.

Based on the results of the screening HHRA and attenuation modeling for protection of groundwater, a site-specific PCBs remediation goal of 7.6 mg/kg has been proposed to be applied as the crushed concrete reuse criteria. Concrete and asphalt slab areas that exceed the remediation goal cannot be reused on-site and will be removed and disposed off-site during below-grade demolition. Concrete and asphalt slab areas with PCB concentrations less than 7.6 mg/kg will be crushed on-site and reused as excavation backfill. Figure 8 shows concrete sampling concentrations and locations and defines areas where PCB concentrations in concrete exceed 1 mg/kg, 7.6 mg/kg, and 50 mg/kg.

9.1.1.1 Site Preparation

PCB-impacted concrete will be demarcated at the Site by painting a “cut line” on the slab to identify those areas previously delineated by concrete coring and laboratory analytical testing. The cut line will encircle areas previously identified to contain PCB concentrations greater than 7.6 mg/kg but less than 50 mg/kg (handled as non-hazardous waste). Slab areas where PCB concentrations exceed 50 mg/kg will also be delineated for separate handling as a hazardous waste.

9.1.1.2 Slab Removal and Stockpiling

Slab areas will be saw-cut along demarcation lines to facilitate removal using construction equipment. PCB-impacted slab areas will be removed, sized appropriately for handling, and temporarily stockpiled on-site prior to disposal. During periods of inactivity, PCB-impacted concrete stockpiles will be covered to prevent exposure to rainwater. Contractor stockpiling activities will be performed pursuant to Section 02114 of the Below Grade Demolition and Soil Excavation Technical Specifications (Technical Specifications) (Appendix E).

9.1.1.3 Concrete Profiling, Transportation, and Disposal

Recent concrete analytical results will be used to create an appropriate waste disposal profile at a facility permitted to receive PCB-impacted wastes. Impacted concrete will then be loaded into trucks for transportation off-site for landfill disposal pursuant to Section 02120 of the Technical Specifications (Appendix E). Each truck load will be covered with either a tarpaulin or plastic sheeting prior to departing the jobsite and all truck exteriors will be inspected and cleaned of any loose soil or debris that may be present on the truck exterior associated with loading activities. The contractor will take proper measures to prevent Site soil or debris from being tracked onto adjacent City right-of-ways during off-site shipment activities. All loads will be properly manifested and placarded.

9.1.2 Surface/Shallow COC-Impacted Soil Remedial Action Implementation

The proposed preferred remedial technology for surface/shallow COC-impacted soil is excavation and off-site disposal. These excavation areas are shown on Figure 11. This remedy will be implemented after below-grade demolition of surface slabs and pavements, utilities and pipelines, pits, sumps, and other deeper structures is complete.

9.1.2.1 Site Preparation

Site preparation activities will include obtaining any necessary permits, implementation of storm water and dust controls, and installation of excavation shoring prior to soil removal. These activities are further described below.

The remaining three groundwater monitoring wells discussed earlier (AOW-6, AOW-8, and AOW-9) are located in the Phase IIIb and Phase IV areas. These wells will remain in place and protected during demolition. It is anticipated that Alcoa will remove the wells in accordance with applicable guidelines listed in the California Department of Water Resources Bulletin 74-81 and 74-90 upon completion of its remediation of the Stoddard solvent contamination and upon receipt of authorization from the RWQCB.

9.1.2.2 Storm Water Controls

Storm water Best Management Practices will be implemented and maintained around the excavation perimeter and soil stockpiling areas pursuant to Section 01502 of the Technical Specifications (Appendix E) and the contractor's Storm Water Pollution Prevention Plan (SWPPP).

9.1.2.3 Dust Controls

Dust control measures will be implemented during soil excavation and handling activities pursuant to Section 01501 of the Technical Specifications (Appendix E).

9.1.2.4 Shoring

Site preparation activities may require installation of shoring around the perimeter of each proposed excavation area pursuant to Section 02260 of the Technical Specifications

(Appendix E). A Shoring Plan will be prepared by the contractor and submitted to the City for review and approval prior to actual shoring installation.

9.1.2.5 Excavation and Stockpiling

Soil will be excavated using a track-mounted excavator capable of removal to depths of greater than 15 feet bgs. Soil will be excavated to the lateral and vertical extent of known COC-impacts based on previous site characterization sampling data. Excavated soil will be staged adjacent to the active excavation then transferred to a lined and bermed temporary stockpile located on-site. Contractor soil stockpiling activities will be performed pursuant to Section 02114 of the Technical Specifications (Appendix E).

9.1.2.6 Confirmation Sampling and Waste Profiling

Confirmation soil sampling within open excavation areas will be conducted by Geomatrix using the procedures described in Appendix B of the Quality Assurance Project Plan (QAPP) (Geomatrix 2007). Representative soil samples will also be collected from the temporary stockpile for waste profiling purposes to meet the acceptance criteria of the receiving facility, prior to off-site landfill disposal. Soil analytical testing will be performed to meet the waste profile requirements of the receiving facility.

9.1.2.7 Off-Site Disposal

COC-impacted soil will be loaded into waste hauling trucks and shipped off-site for landfill disposal pursuant to Section 02120 of the Technical Specifications (Appendix E). Each truck load will be covered with either a tarpaulin or plastic sheeting prior to departing the jobsite, and all truck exteriors will be inspected and cleaned of any loose soil that may be present on the truck exterior associated with loading activities. The contractor will take proper measures to prevent Site soil from being tracked onto adjacent City right-of-ways during off-site shipment activities. All loads will be properly manifested and placarded.

9.1.2.8 Backfilling and Grading

Excavation areas will be backfilled with recycled crushed aggregates obtained from on-site crushing of concrete demolition debris. Aggregates will be crushed to the gradations provided in Section 02050 of the Technical Specifications (Appendix E), and they will be backfilled and compacted pursuant to Section 02351 of the Technical Specifications (Appendix E).

9.1.2.9 Schedule for Implementation

Excavation and off-site disposal of the COC-impacted soil will be performed by the contractor during the implementation of below grade demolition and soil excavation work. Below grade demolition work is anticipated to start shortly after agency review of the FS/RAP and be completed approximately three months later. Initial activities will consist of preparation and review of contractor submittals and associated permitting efforts followed by demolition of below grade features at the Site.

9.1.3 Shallow and Deep VOC-Impacted Soil Remedial Action Implementation

The proposed preferred remedial technology for shallow and deep VOC-impacted soil (containing TCE, PCE and benzene) in the Phase I area is in situ SVE. This remedy will be implemented upon completion of below-grade demolition activities associated with slab, foundation, footing, and other structure removal in the Phase I area at the Site. A network of SVE wells will be installed with well screen intervals both above and below the fine-grained soil layer present from approximately 50 to 70 feet bgs in the northern portion of the Site. SVE wells will be installed within the area of known impacts and at other locations where VOCs were detected during the soil vapor survey at concentrations that exceeded screening levels. Soil cuttings will be containerized as investigation-derived waste for eventual profiling and off-site disposal. Specific details regarding the SVE system and associated remediation equipment /components are provided below.

9.1.3.1 Site Preparation

After completion of below-grade demolition and limited soil excavation work related to footings and foundations removals in the Phase I area, the area will be re-graded level and compacted. The area will be topographically lower than previous Site conditions prior to foundation and soil removal. A four- to six-inch thick layer of crushed recycled aggregates will be spread across the Phase I area to provide a suitable working surface during implementation of the SVE system.

A three-phase, 230-volt, 100-ampere temporary electrical power service panel will be installed on a temporary power pole in the northwest corner of the Site to obtain electricity from existing power lines located along Fruitland Avenue. The temporary power pole and electrical service panel will be required to operate the SVE system, and will be located inside the existing concrete perimeter wall near the intersection of Boyle and Fruitland Avenues.

9.1.3.2 Well Installation

SVE wells will be installed in the Phase I area at two specific depth intervals as presented below:

SVE Well Depth	Well Screen Interval (feet bgs)	Well Lateral Spacing	Number of Wells
Surface to 50 feet bgs	40 to 50	100 feet	10
Surface to 90 feet bgs	80 to 90	150 feet	3

Wellhead completions will consist of an above-ground flow-controlling ball valve and sample port for periodic soil vapor monitoring. Each SVE well will be constructed using Schedule 80 polyvinyl chloride (PVC) pipe with a 0.020-inch slot screen size, a sand filter pack surrounding the well screen, a bentonite seal, and a concrete surface seal.

9.1.3.3 Temporary Piping

SVE wells will be connected to the treatment equipment with temporary Schedule 80 PVC piping and/or flexible suction hose placed directly upon the gravel surface. Each well will be conveyed to a common header line, adequate to support the combined soil vapor pressures and flow rates from each SVE well, and then to the portable SVE equipment.

9.1.3.4 Treatment Equipment

The treatment equipment will consist of up to two (2) skid-mounted systems, each containing a moisture knockout drum, a liquid ring (LR) blower/compressor capable of applying a vacuum of 100 inches of water and a flow rate of 250 cfm, two (2) 1,000-pound vapor-phase granular activated carbon (vGAC) vessels, and associated equipment connections. The moisture knockout drum will be situated upstream of the LR compressor/blower with the vGAC vessels configured in series and installed downstream of the LR compressor/blower. A SVE process flow diagram is presented on Figure 12.

The LR compressor/blower will convey extracted soil vapors from the SVE well field to the common header line, through the moisture knockout drum, and then to the vGAC vessels. Any moisture that collects in the knockout drum will be pumped/transferred to and stored in 55-gallon capacity Department of Transportation approved drums. The drums will be characterized and transported off-site as appropriate. Treated soil vapors conveyed through the vGAC vessels will be discharged to the atmosphere using AQMD Various Locations Permit conditions.

Based upon the results of periodic soil vapor monitoring and the observed radii of influence for the operating SVE wells, a second skid-mounted system may be used to expedite deeper zone (i.e., 80 to 90 feet bgs) SVE remediation.

9.1.3.5 Operations, Maintenance, and Monitoring

Following installation of the SVE system, Geomatrix will conduct start-up testing/monitoring to check the efficiency and operation of the system. The start-up testing will include a diagnostic check of each component including, but not limited to, the knockout drum controls, LR compressor/blower operation, emergency shutdown controls, high temperature and level alarms, and leaks in piping. Start-up testing will be conducted by the selected SVE remediation equipment vendor.

Operation of the SVE system will begin after completing start-up testing. The system will be monitored initially by on-site demolition field personnel at a minimum of twice per week during the first month of operation. Geomatrix will collect measurements that will be used to evaluate the system's overall performance and effectiveness in remediating the VOC-impacted soils as part of these inspections. These measurements will consist of recording system operating parameters including: hours of operation, operating temperatures, extraction flow rates, and inlet and outlet vapor concentrations for the GAC vessels. SVE system monitoring activities will be performed on a weekly basis or as needed after the first month of operation. Maintenance performed during routine system inspections and/or monitoring will consist of SVE vendor and/or equipment factory specifications. As part of the monitoring of the system, influent and effluent concentrations will be measured using a portable organic vapor meter which detects and quantifies organic vapors with a photoionization detector (PID). Results of operation monitoring will be recorded on emission monitoring logs. Influent and effluent vapor samples will be collected in a 1 liter tedlar bag using an oil-less sampling pump and submitted to an analytical laboratory on a monthly basis. Additional monitoring will be performed in accordance with the AQMD various locations permit to operate.

9.1.3.6 Schedule for Implementation and Completion

SVE of shallow and deep VOC-impacted soil will commence after below-grade demolition and soil excavation work is completed in the Phase I area. The milestone phasing and completion of work as described in Section 01110 of the Technical Specifications (Appendix E) require the contractor to complete all below grade demolition work in the Phase I area within 40 calendar days after mobilizing to the Site and installation of required temporary facilities and controls. SVE system installation and SVE operations will begin approximately four weeks after contractor completion of below grade demolition work in the Phase I area.

SVE operation will continue until power plant site redevelopment activities commence or until effluent vapor monitoring from SVE wells indicate vapor concentrations have reached asymptotic conditions. If asymptotic conditions have not been reached prior to power plant redevelopment activities, SVE wells will be decommissioned, and SVE operations will be suspended until power plant construction is complete. After construction is complete, new

SVE wells will be installed and operated until asymptotic conditions are obtained. The system will then be shut-down to undergo vapor rebound testing, followed by additional operations as necessary. No soil confirmation sampling will be performed. System performance and termination of operation will be based on monitoring of in situ soil vapor concentrations obtained from soil vapor confirmation sampling performed after completion of vapor rebound testing. As discussed in Section 8.3, soil samples may be collected and analyzed to document the remaining concentrations of the VOCs in soil for a deed covenant for the Site.

9.2 SOIL MANAGEMENT DURING BELOW-GRADE DEMOLITION

The demolition contractor will be responsible for proper handling and disposal of impacted soil removed during demolition and permits associated with these activities and the demolition. There is a potential for impacted soil to be encountered during removal of pavements, floor slabs, footings, foundations, utilities, and other below-grade structures (e.g. sumps, drains, clarifier, etc.). As these features are removed during demolition, the demolition contractor, in coordination with Geomatrix, will follow the procedures described in this section. The procedures associated with the below grade-demolition described in this section are included in the project technical specifications provided in Appendix E.

During removal of the slab and other below-grade structures, the demolition contractor will monitor for hazardous vapors and observe the condition of the underlying surface of the concrete slab and the condition of the soil underlying the slab. If areas of impacted soil that were not included in the areas shown on Figure 11 and addressed in Section 9.1.2 are observed (based on visual staining and/or noticeable odors), the demolition contractor will take the following general steps.

1. Notification - notify the Geomatrix Site manager and begin air monitoring with a PID.

2. Monitoring - after notifying Geomatrix, conduct initial air monitoring for health and safety and AQMD permitting compliance with the PID. If PID readings are above Rule 1166 permit criteria, continue using Rule 1166 requirements and the requirements of Section 02114 of the Technical Specifications (Appendix E). If the PID readings are above health and safety air monitoring thresholds, workers will upgrade to the appropriate PPE specified in the demolition contractor's Health and Safety Plan (HASP).

3. Segregation - segregate impacted soil from the slab or structure(s) already being removed. As visually impacted structures are removed, the suspect soil directly adjacent to and beneath the structures will also be excavated, segregated, and/or stockpiled on plastic (with a minimum thickness of 6 mil) and covered with plastic or placed in covered roll-off bins or in end dumps, as needed based on volume.

4. Soil removal - conduct exploratory soil removals to assess the extent of impacted soil based on visual indicators and continue air monitoring:

    - if the area of impacted soil appears to be a “small area” (up to 100 cubic yards of soil), continue to remove soil and stockpile as needed, then continue with demolition work.

    - if the area of impacted soil appears to be greater than 100 cubic yards (“large area”), work in this area will be coordinated and phased with other Site activities related to excavation of known COC-impacted soils. The area will then be visually demarcated by the contractor.

    - COC-impacted areas will then be excavated to the extent necessary to meet site-specific remediation goals discussed in Section 5.2.

5. Confirmation sampling - confirmation soil sampling will be conducted by Geomatrix using the procedures described in the QAPP (Geomatrix, 2007). The analytical suite for soil samples tested may include VOCs, PCBs, or metals. If additional samples are collected, the soil analytical results will be compared to the site-specific remediation goals discussed in Section 5.1 to assess the need for additional removal or backfilling of the excavation. If soil testing is deemed not necessary based on existing data, the excavation will be backfilled.

6. Excavation backfill - after confirmation sampling is complete, excavations will be backfilled and compacted by the demolition contractor as described in the Below Grade Demolition Plan (Geomatrix, 2006b). Concrete and asphalt debris with concentrations of COCs less than the remediation goals will be crushed to the gradations provided in Section 02050 of the Technical Specifications, and backfilled and compacted pursuant to Section 02351 of the Technical Specifications (Appendix E).

During these activities, health and safety procedures will be implemented by the demolition contractor as described in their HASP and by Geomatrix as described in their site-specific HASP. In addition, dust suppression and vapor and/or odor control will be implemented by the demolition contractor as needed using the requirements of Section 01501 of the Technical Specifications (Appendix E).

Stockpiled soil will be sampled for analysis by Geomatrix. Soil and waste disposal profiling will be completed by the contractor and soil will be transported using appropriate shipping manifests or bills-of-lading. The demolition contractor will notify Geomatrix prior to shipping any impacted soil and waste off-site. Storm water management associated with the stockpiled materials will be the responsibility of the demolition contractor pursuant to Section 01502 of the Technical Specifications (Appendix E) and the contractor’s SWPPP.

10.0 PUBLIC PARTICIPATION

As required by the NCP 40 CFR 300.430(c)(1), Pechiney will ensure that the public is informed and has the opportunity to participate in the overall remedial action for the Site. A comprehensive community involvement plan will be submitted following the submittal of this FS/RAP. Public participation will be implemented as part of demolition and remediation activities. The community involvement program and activities are described below.

10.1 COMMUNITY INVOLVEMENT PROGRAM

The objective of the community involvement program is to inform the community of the progress of demolition and remediation activities and to effectively respond to health environment and safety concerns and questions. The community involvement program will be consistent with CERCLA as implemented by the NCP 40 CFR 300.430(c)(1). The purpose of these activities as stated by the NCP 40 CFR 300.430(c)(2)(ii)(A) is to "ensure the public appropriate opportunities for involvement in a wide variety of Site related decisions, including Site analysis and characterization, alternatives analysis, and selection of remedy; and to determine, based on community interviews, appropriate activities to ensure such public involvement."

Objectives of the community involvement program include:

- soliciting input from the community on concerns about the remedial activities;
- establishing effective channels of communication between the community, Pechiney, and the City of Vernon H&EC;
- informing the community about progress of the remedial activities; and
- providing adequate opportunities for the community to participate and comment on the proposed remedial activities.

10.2 COMMUNITY INVOLVEMENT ACTIVITIES

To date, Pechiney has conducted community outreach activities to its immediate neighbors including face-to-face visits from the Geomatrix project and field engineers. As part of the below-grade demolition phase of the project, Pechiney will distribute information to the immediate neighbors of the Site including proposed activities and schedule of work.

Prior to the start of the remedial excavation activities, Pechiney will expand its outreach and distribute an information sheet to businesses and residents surrounding the Site and to other interested stakeholders. This information sheet will include information about the Site, remedial activities, and project contacts. Additionally, a local information repository will be established to make documents and other information available for the public and a Site mailing list will be developed.

This FS/RAP will be made available to the public for a comment period of at least 30 days. Pechiney will work with the City of Vernon H&EC to respond to any comments and to provide a timely opportunity for the public to access documents.

Depending on the level of community response and level of interest, Pechiney will hold a community meeting to discuss the components of the FS/RAP, the Site's history, and proposed remedial work. The meeting may also provide the opportunity for the public to submit comments on the FS/RAP. Pechiney will work with the community to develop a meeting format that suits the community's needs.

These and other recommended activities will be presented to the City of Vernon H&EC in a Community Involvement Plan that will be submitted after the FS/RAP. The schedule of implementation of these activities will be established in coordination with the City of Vernon H&EC.

Depending on the level of interest from the community about the Site, Pechiney will evaluate whether additional activities are necessary. The level of interest from the community will be evaluated using the volume of public comments and the nature of community concerns and questions expressed. The City of Vernon H&EC will oversee all community involvement activities throughout the proposed FS/RAP implementation and to ensure that they are conducted in compliance with state and federal regulations.

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TABLES

TABLE 1

SUMMARY OF RISK-BASED SCREENING LEVELS[1] FOR CHEMICALS OF POTENTIAL CONCERN IN SOIL

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Compound	RBSL in milligrams per kilogram (mg/kg)					
		Construction Worker		Outdoor Commercial/Industrial Worker		Indoor Commercial/Industrial Worker	
		Cancer	Noncancer	Cancer	Noncancer	Cancer	Noncancer
Polychlorinated Biphenyls (PCBs)							
11141165	Aroclor-1232	7.6E+00	--	7.4E-01	--	--	--
12672296	Aroclor-1248	7.6E+00	--	7.4E-01	--	--	--
11097691	Aroclor-1254	7.6E+00	4.4E+00	7.4E-01	1.1E+01	--	--
11096825	Aroclor-1260	7.6E+00	--	7.4E-01	--	--	--
Metals							
7440382	Arsenic	2.0E+00	7.6E+01	2.4E-01	2.4E+02	--	--
7440439	Cadmium	4.8E+02	1.2E+02	1.3E+03	5.0E+02	--	--
7440508	Copper	NC	1.1E+04	NC	3.5E+04	--	--
7439921	Lead[2]	9.8E+02		3.3E+03		--	
7439976	Mercury	--	7.0E+01	--	1.8E+02	--	--
7440666	Zinc	NC	9.0E+04	NC	2.9E+05	--	--
Volatile Organic Compounds (VOCs)[3]							
100414	Ethylbenzene	1.5E+03	2.4E+04	1.6E+02	6.2E+04	--	--
127184	Tetrachloroethylene (PCE)	3.1E+01	2.4E+03	3.2E+00	6.2E+03	--	--
108883	Toluene	--	1.9E+04	--	4.9E+04	--	--
79016	Trichloroethylene (TCE)	1.3E+03	7.1E+01	1.3E+02	1.8E+02	--	--
108383	m/p-Xylenes	--	4.8E+04	--	1.2E+05	--	--
95476	o-Xylene	--	4.8E+04	--	1.2E+05	--	--

Notes:

1. Calculation of risk-based screening levels (RBSLs) presented in Appendix B.
2. RBSLs developed for lead based on blood-lead levels, not probability of increased cancer risk or noncancer hazard quot
3. Inhalation pathways not incorporated into the development of RBSLs for volatile organic compounds. Volatilization of ch from the subsurface to ambient or indoor air evaluated using soil vapor measurements and RBSLs developed for this da

Abbreviations:

CAS No. = chemical abstract service number
NC = noncarcinogenic
RBSL = risk-based screening level
-- = not applicable

TABLE 2

SUMMARY OF RISK-BASED SCREENING LEVELS[1] FOR CHEMICALS OF POTENTIAL CONCERN IN SOIL VAPOR

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Compound	RBSL in micrograms per liter (µg/L)					
		Construction Worker - Exposure to Ambient Air		Outdoor Commercial/Industrial Worker - Exposure to Ambient Air		Indoor Commercial/Industrial Worker - Exposure to Indoor Air	
		Cancer	Noncancer	Cancer	Noncancer	Cancer	Noncancer
67663	Chloroform	3.5E+03	7.9E+04	7.0E+02	4.0E+05	1.4E+00	8.0E+02
75354	1,1-Dichloroethylene	--	3.3E+04	--	1.7E+05	--	2.0E+02
127184	Tetrachloroethylene (PCE)	4.5E+03	1.3E+04	9.1E+02	6.7E+04	1.6E+00	1.2E+02
108883	Toluene	--	6.6E+04	--	3.3E+05	--	8.9E+02
71556	1,1,1-Trichloroethane	NC	8.8E+05	NC	4.4E+06	NC	7.0E+03
79016	Trichloroethylene (TCE)	1.0E+04	1.7E+05	2.0E+03	8.6E+05	4.4E+00	1.9E+03
108383	m/p-Xylenes	--	1.3E+05	--	6.3E+05	--	2.2E+03

Notes:
1. Calculation of risk-based screening levels presented in Appendix B.

Abbreviations:
CAS No. = chemical abstract service number
NC = noncarcinogenic
RBSL = risk-based screening level
-- = not applicable

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TABLE 3

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE I AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (mg/kg)	Soil RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil RBSL -- Construction Worker		Predicted Risks	
			Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient	Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient
12672296	**Aroclor-1248**	29	7.4E-01	--	**3.9E-05**	--	7.6E+00	--	**3.8E-06**	--
11096825	**Aroclor-1260**	13	7.4E-01	--	**1.7E-05**	--	7.6E+00	--	**1.7E-06**	--
100414	Ethylbenzene	0.0045	1.6E+02	6.2E+04	2.9E-11	7.3E-08	1.5E+03	2.4E+04	3.0E-12	1.9E-07
127184	Tetrachloroethylene (PCE)	0.0084	3.2E+00	6.2E+03	2.6E-09	1.4E-06	3.1E+01	2.4E+03	2.7E-10	3.5E-06
108883	Toluene	0.0085	--	4.9E+04	--	1.7E-07	--	1.9E+04	--	4.5E-07
79016	Trichloroethylene (TCE)	0.094	1.3E+02	1.8E+02	7.1E-10	5.1E-04	1.3E+03	7.1E+01	7.3E-11	1.3E-03
1330207	m/p-Xylenes	0.017	--	1.2E+05	--	1.4E-07	--	4.8E+04	--	3.6E-07
95476	o-Xylene	0.0055	--	1.2E+05	--	4.5E-08	--	4.8E+04	--	1.2E-07
Cumulative Risk/Hazard Index					6.E-05	5.E-04			6.E-06	1.E-03

Notes:

Chemicals contributing a cancer risk level greater than 1×10^{-6} or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:

CAS No. = chemical abstract service number
mg/kg = milligrams per kilogram
RBSL = risk-based screening level
-- = not applicable

TABLE 4

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE II AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (mg/kg)	Soil RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil RBSL -- Construction Worker		Predicted Risks	
			Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient	Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient
12672296	**Aroclor-1248**	960	7.4E-01	--	**1.3E-03**	--	7.6E+00	--	**1.3E-04**	--
11096825	Aroclor-1260	0.3	7.4E-01	--	4.0E-07	--	7.6E+00	--	3.9E-08	--
7440508	Copper	193	NC	3.5E+04	--	5.4E-03	NC	1.1E+04	--	1.7E-02
7440666	Zinc	607	NC	2.9E+05	--	2.1E-03	NC	9.0E+04	--	6.7E-03
108883	Toluene	0.0021	--	4.9E+04	--	4.3E-08	--	1.9E+04	--	1.1E-07
1330207	m/p-Xylenes	0.0036	--	1.2E+05	--	2.9E-08	--	4.8E+04	--	7.6E-08
95476	o-Xylene	0.0024	--	1.2E+05	--	1.9E-08	--	4.8E+04	--	5.0E-08
Cumulative Risk/Hazard Index					1.E-03	8.E-03			1.E-04	2.E-02

Notes:

Chemicals contributing a cancer risk level greater than $1x10^{-6}$ or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:

CAS No. = chemical abstract service number
mg/kg = milligrams per kilogram
RBSL = risk-based screening level
-- = not applicable

TABLE 5

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE IIIa AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (mg/kg)	Soil RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil RBSL -- Construction Worker		Predicted Risks	
			Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient	Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient
12672296	**Aroclor-1248**	7.1	7.4E-01	--	**9.5E-06**	--	7.6E+00	--	9.3E-07	--
11097691	**Aroclor-1254**	5.2	7.4E-01	1.1E+01	**7.0E-06**	4.9E-01	7.6E+00	4.4E+00	6.8E-07	**1.2E+00**
11096825	Aroclor-1260	0.1	7.4E-01	--	1.3E-07	--	7.6E+00	--	1.3E-08	--
7440382	**Arsenic**	60	2.4E-01	2.4E+02	**2.5E-04**	2.5E-01	2.0E+00	7.6E+01	**2.9E-05**	7.9E-01
7440508	Copper	257	NC	3.5E+04	--	7.2E-03	NC	1.1E+04	--	2.3E-02
Cumulative Risk/Hazard Index					3.E-04	7.E-01			3.E-05	2.E+00

Notes:

Chemicals contributing a cancer risk level greater than 1×10^{-6} or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:

CAS No. = chemical abstract service number
mg/kg = milligrams per kilogram
RBSL = risk-based screening level
-- = not applicable

TABLE 6

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS --
PHASE IV AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (mg/kg)	Soil RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil RBSL -- Construction Worker		Predicted Risks	
			Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient	Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient
11141165	**Aroclor-1232**	470	7.4E-01	--	**6.3E-04**	--	7.6E+00	--	**6.2E-05**	--
12672296	Aroclor-1248	0.25	7.4E-01	--	3.4E-07	--	7.6E+00	--	3.3E-08	--
11096825	**Aroclor-1260**	1.2	7.4E-01	--	**1.6E-06**	--	7.6E+00	--	1.6E-07	--
7440382	**Arsenic**	120	2.4E-01	2.4E+02	**5.0E-04**	5.0E-01	2.0E+00	7.6E+01	**5.9E-05**	**1.6E+00**
7440439	Cadmium	2.8	1.3E+03	5.0E+02	2.2E-09	5.6E-03	4.8E+02	1.2E+02	5.9E-09	2.3E-02
7439976	Mercury	0.98	--	1.8E+02	--	5.3E-03	--	7.0E+01	--	1.4E-02
Cumulative Risk/Hazard Index					1.E-03	5.E-01			1.E-04	2.E+00

Notes:

Chemicals contributing a cancer risk level greater than $1x10^{-6}$ or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:

CAS No. = chemical abstract service number
mg/kg = milligrams per kilogram
RBSL = risk-based screening level
-- = not applicable

TABLE 7

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE VI AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (mg/kg)	Soil RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil RBSL -- Construction Worker		Predicted Risks	
			Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient	Cancer (mg/kg)	Noncancer (mg/kg)	Risk	Hazard Quotient
12672296	Aroclor-1248	0.14	7.4E-01	--	1.9E-07	--	7.6E+00	--	1.8E-08	--
11096825	Aroclor-1260	0.57	7.4E-01	--	7.7E-07	--	7.6E+00	--	7.5E-08	--
7440382	**Arsenic**	74	2.4E-01	2.4E+02	**3.1E-04**	3.1E-01	2.0E+00	7.6E+01	**3.6E-05**	9.8E-01
Cumulative Risk/Hazard Index					3.E-04	3.E-01			4.E-05	1.E+00

Notes:

Chemicals contributing a cancer risk level greater than 1×10^{-6} or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:

CAS No. = chemical abstract service number
mg/kg = milligrams per kilogram
RBSL = risk-based screening level
-- = not applicable

TABLE 8

SUMMARY OF MAXIMUM PREDICTED LIFETIME EXCESS CANCER RISKS AND NONCANCER HAZARD INDEXES -- SOIL EXPOSURE

Former Pechiney Cast Plate, Inc., Facility

Vernon, California

Area	Cancer Risks		Noncancer HIs	
	Outdoor Commercial/Industrial Worker	Construction Worker	Outdoor Commercial/Industrial Worker	Construction Worker
Phase I	6E-05	6E-06	5E-04	1E-03
Phase II	1E-03	1E-04	8E-03	2E-02
Phase IIIa	3E-04	3E-05	7E-01	2E+00
Phase IIIb	--[1]	--[1]	--[1]	--[1]
Phase IV	1E-03	1E-04	5E-01	2E+00
Phase V	--[2]	--[2]	--[2]	--[2]
Phase VI	3E-04	4E-05	3E-01	1E+00

Notes:

1. No chenicals of potential concern were identified in soil in the Phase IIIb Area.
2. No chemicals were detected in soil in the Phase V Area except for metals below background.

Abbreviations:

HI = hazard index

-- = not applicable

TABLE 9

COMPARISON OF MAXIMUM SOIL VAPOR CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE I AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (µg/L)	Soil Vapor RBSL -- Indoor Commercial/Industrial Worker		Predicted Risks		Soil Vapor RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil Vapor RBSL -- Construction Worker		Predicted Risks	
			Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient	Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient	Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient
67663	**Chloroform**	2.5	1.4E+00	8.0E+02	**1.8E-06**	3.1E-03	7.0E+02	4.0E+05	3.6E-09	6.3E-06	3.5E+03	7.9E+04	7.1E-10	3.1E-05
75354	1,1-Dichloroethylene	22	--	2.0E+02	--	1.1E-01	--	1.7E+05	--	1.3E-04	--	3.3E+04	--	6.6E-04
127184	**Tetrachloroethylene (PCE)**	120	1.6E+00	1.2E+02	**7.6E-05**	**1.0E+00**	9.1E+02	6.7E+04	1.3E-07	1.8E-03	4.5E+03	1.3E+04	2.6E-08	8.9E-03
108883	Toluene	4.7	--	8.9E+02	--	5.3E-03	--	3.3E+05	--	1.4E-05	--	6.6E+04	--	7.2E-05
71556	1,1,1-Trichloroethane	13	NC	7.0E+03	--	1.9E-03	NC	4.4E+06	--	3.0E-06	NC	8.8E+05	--	1.5E-05
79016	**Trichloroethylene (TCE)**	1900	4.4E+00	1.9E+03	**4.3E-04**	**1.0E+00**	2.0E+03	8.6E+05	9.5E-07	2.2E-03	1.0E+04	1.7E+05	1.9E-07	1.1E-02
1330207	m,p-Xylenes	2	--	2.2E+03	--	9.0E-04	--	6.3E+05	--	3.2E-06	--	1.3E+05	--	1.6E-05
Cumulative Risk/Hazard Index					5.E-04	2.E+00			1.E-06	4.E-03			2.E-07	2.E-02

Notes:
Chemicals contributing a cancer risk level greatern than $1x10^{-6}$ or a hazard quotient of 1 for either receptor are highlighted in **bold**.

Abbreviations:
CAS No. = chemical abstract service number
µg/L = micrograms per liter
RBSL = risk-based screening level
-- = not applicable

TABLE 10

COMPARISON OF MAXIMUM SOIL VAPOR CONCENTRATIONS TO RISK-BASED SCREENING LEVELS --
PHASE II AREA
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (µg/L)	Soil Vapor RBSL -- Indoor Commercial/Industrial Worker		Predicted Risks		Soil Vapor RBSL -- Outdoor Commercial/Industrial Worker		Predicted Risks		Soil Vapor RBSL -- Construction Worker		Predicted Risks	
			Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient	Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient	Cancer (µg/L)	Noncancer (µg/L)	Risk	Hazard Quotient
127184	Tetrachloroethylene (PCE)	0.53	1.6E+00	1.2E+02	3.4E-07	4.5E-03	9.1E+02	6.7E+04	5.8E-10	7.9E-06	4.5E+03	1.3E+04	1.2E-10	4.0E-05
79016	Trichloroethylene (TCE)	2.4	4.4E+00	1.9E+03	5.5E-07	1.3E-03	2.0E+03	8.6E+05	1.2E-09	2.8E-06	1.0E+04	1.7E+05	2.4E-10	1.4E-05
Cumulative Risk/Hazard Index					9.E-07	6.E-03			2.E-09	1.E-05			4.E-10	5.E-05

Abbreviations:
CAS No. = chemical abstract service number
µg/L = micrograms per liter
RBSL = risk-based screening level

TABLE 11

COMPARISON OF MAXIMUM SOIL VAPOR CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- PHASE V AREA

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

CAS No.	Chemical	Maximum Concentration (µg/L)	Soil Vapor RBSL -- Indoor Commercial/Industrial Worker: Cancer (µg/L)	Soil Vapor RBSL -- Indoor Commercial/Industrial Worker: Noncancer (µg/L)	Predicted Risks: Risk	Predicted Risks: Hazard Quotient	Soil Vapor RBSL -- Outdoor Commercial/Industrial Worker: Cancer (µg/L)	Soil Vapor RBSL -- Outdoor Commercial/Industrial Worker: Noncancer (µg/L)	Predicted Risks: Risk	Predicted Risks: Hazard Quotient	Soil Vapor RBSL -- Construction Worker: Cancer (µg/L)	Soil Vapor RBSL -- Construction Worker: Noncancer (µg/L)	Predicted Risks: Risk	Predicted Risks: Hazard Quotient
127184	Tetrachloroethylene (PCE)	0.22	1.6E+00	1.2E+02	1.4E-07	1.9E-03	9.1E+02	6.7E+04	2.4E-10	3.3E-06	4.5E+03	1.3E+04	4.8E-11	1.6E-05
108883	Toluene	0.51	--	8.9E+02	--	5.7E-04	--	3.3E+05	--	1.6E-06	--	6.6E+04	--	7.8E-06
1330207	m,p-Xylenes	0.48	--	2.2E+03	--	2.1E-04	--	6.3E+05	--	7.7E-07	--	1.3E+05	--	3.8E-06
Cumulative Risk/Hazard Index					1.E-07	3.E-03			2.E-10	6.E-06			5.E-11	3.E-05

Abbreviations:
- CAS No. = chemical abstract service number
- µg/L = micrograms per liter
- RBSL = risk-based screening level
- -- = not applicable

TABLE 12

SUMMARY OF MAXIMUM PREDICTED LIFETIME EXCESS CANCER RISKS AND NONCANCER HAZARD INDEXES -- SOIL VAPOR EXPOSURE

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Area	Cancer Risks			Noncancer HIs		
	Indoor Commercial/Industrial Worker	Outdoor Commercial/Industrial Worker	Construction Worker	Indoor Commercial/Industrial Worker	Outdoor Commercial/Industrial Worker	Construction Worker
Phase I	5E-04	1E-06	2E-07	2E+00	4E-03	2E-02
Phase II	9E-07	2E-09	4E-10	6E-03	1E-05	5E-05
Phase IIIa	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]
Phase IIIb	--[2]	--[2]	--[2]	--[2]	--[2]	--[2]
Phase IV	--[2]	--[2]	--[2]	--[2]	--[2]	--[2]
Phase V	1E-07	2E-10	5E-11	3E-03	6E-06	3E-05
Phase VI	--[1]	--[1]	--[1]	--[1]	--[1]	--[1]

Notes:

1. No volatile organic compounds were detected in soil vapor in the Phase IIIa and Phase VI Areas.
2. No chemicals of potential concern were identified in soil vapor in the Phase IIIb and Phase IV Areas.

Abbreviations:

HI = hazard index
VOC = volatile organic compound
-- = not applicable

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TABLE 13

SUMMARY OF MAXIMUM PREDICTED LIFETIME EXCESS CANCER RISKS AND NONCANCER HAZARD INDEXES -- CUMULATIVE EXPOSURE

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Area	Cancer Risks			Noncancer HIs		
	Indoor Commercial/Industrial Worker	**Outdoor Commercial/Industrial Worker**	**Construction Worker**	**Indoor Commercial/Industrial Worker**	**Outdoor Commercial/Industrial Worker**	**Construction Worker**
Phase I	**5E-04**	6E-05	6E-06	**2**	5E-03	2E-02
Phase II	9E-07	**1E-03**	**1E-04**	6E-03	8E-03	2E-02
Phase IIIa	--[1]	**3E-04**	3E-05	--[1]	7E-01	**2**
Phase IIIb	--[2]	--[2]	--[2]	--[2]	--[2]	--[2]
Phase IV	--[3]	**1E-03**	**1E-04**	--[3]	1	**2**
Phase V	1E-07	2E-10	5E-11	3E-03	6E-06	3E-05
Phase VI	--[1]	**3E-04**	4E-05	--[1]	3E-01	1

Notes:

Cancer risks and HIs above the ranges considered acceptable by regulatory agencies are highlighted in **bold**.

1. No volatile organic compounds were detected in soil vapor in the Phase IIIa and Phase VI Areas.
2. No chemicals of potential concern (COPCs) were identified in soil or soil vapor in the Phase IIIb Area.
3. No COPCs were identified in soil vapor in the Phase IV Area.

Abbreviations:

HI = hazard index
VOC = volatile organic compound
-- = not applicable

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TABLE 14

COMPARISON OF MAXIMUM SOIL CONCENTRATIONS TO RISK-BASED SCREENING LEVELS -- LEAD

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Area	Lead Maximum Concentration (mg/kg)	Outdoor Commercial/Industrial Worker		Construction Worker	
		Screening Level	Risk Ratio[1]	Screening Level	Risk Ratio[1]
Phase I	8 [2]	3300	--	980	--
Phase II	82	3300	2.5E-02	980	8.4E-02
Phase IIIa	157	3300	4.8E-02	980	1.6E-01
Phase IIIb	12 [2]	3300	--	980	--
Phase IV	55 [2]	3300	--	980	--
Phase V	28.8 [2]	3300	--	980	--
Phase VI	23.4 [2]	3300	--	980	--

Notes:

1. Ratio of lead concentration to risk-based screening level.
2. Below 80.9 mg/kg, the maximum background level established for the Site from Bradford, et al. (1996) as modified by the City of Vernon H&EC; risk ratios not estimated.

Abbreviations:

mg/kg = milligrams per kilogram
NA = not analyzed
-- = not applicable

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TABLE 15

SOIL SCREENING LEVELS FOR SELECTED VOCS FOR THE PROTECTION OF GROUNDWATER

Former Pechiney Cast Plate, Inc., Facility

Vernon, California

depth (ft)	Concentration in micrograms per kilogram (ug/kg[2]									
	Trichloroethene	Tetrachloroethene	Benzene	Toluene	n-Butyl benzene	1,2-Dichloroethane	Isopropyl benzene	n-Propyl benzene	1,2,4-Trimethylbenzene	1,3,5-Trimethylbenzene
1	152	764	15	9,058	169,622	1.8	39,451	169,622	282,856	62,394
10	145	732	15	8,670	162,348	1.7	37,759	162,348	270,726	59,718
20	138	694	14	8,227	154,053	1.6	35,830	154,053	256,893	56,667
30	130	655	13	7,769	145,478	1.5	33,836	145,478	242,593	53,513
40	122	615	12	7,292	136,547	1.4	31,758	136,547	227,700	50,227
50	114	572	11	6,777	126,914	1.3	29,518	126,914	211,638	46,684
60	80	404	8	4,790	89,688	0.9	20,860	89,688	149,561	32,991
70	60	301	6	3,565	66,753	0.7	15,526	66,753	111,315	24,554
80	52	260	5	3,081	57,688	0.6	13,417	57,688	96,199	21,220
90	36	183	4	2,164	40,521	0.5	9,425	40,521	67,572	14,905
100	27	138	3	1,634	30,593	0.5	7,115	30,593	51,016	11,253
110	12	59	1	702	13,146	0.5	3,057	13,146	21,921	4,835
120	9	44	1	530	9,819	0.5	2,312	9,819	16,370	3,621
130	5	19	1	229	4,159	0.5	1,004	4,159	6,930	1,542
140	5	10	1	150	2,144	0.5	770	2,144	3,567	807
149	5	5	1	150	260	0.5	770	260	369	330

1. Calculations based on Appendix A, "Attenuation Factor Method For VOCs" of "Remediation Guidance For Petroleum and VOC Impacted Sites" in Interim Site Assessment & Cleanup Guidebook published by the California Regional Water Quality Control Board, Los Angeles Region.
2. In some cases, detection limits were above screening levels.

TABLE 16A

SITE-SPECIFIC REMEDIATION GOALS
VOCs in Soil Vapor
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Compound	Remediation Goal (micrograms per liter; μg/L)	Explanation
Under Future Use as a Power Plant		
No COCs identified.		
Under Alternative Future Commercial/Industrial Use		
Chloroform	4.7	Derived from the Carcinogenic RBSL[1] for Indoor Commercial/Industrial Workers (1.4 mg/L). A chloroform concentration of 4.7 mg/L is protective of cumulative indoor commercial/industrial worker exposure to the VOC COCs, based on a target cancer risk of 10^{-5}.
Tetrachloroethylene (PCE)	5.3	Derived from the Carcinogenic RBSL for Indoor Commercial/Industrial Workers (1.6 mg/L). A PCE concentration of 5.3 mg/L is protective of cumulative indoor commercial/industrial worker exposure to the VOC COCs, based on a target cancer risk of 10^{-5}.
Trichloroethylene (TCE)	14.7	Derived from the Carcinogenic RBSL for Indoor Commercial/Industrial Workers (4.4 mg/L). A TCE concentration of 14.7 mg/L is protective of cumulative indoor commercial/industrial worker exposure to the VOC COCs, based on a target cancer risk of 10^{-5}.

Notes:
1. RBSL- Risk-Based Screening Level. Developed based on the methodology described in Appendix B, RBSLs were used to conduct the screening-level human health risk assessment (Section 4.0).

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TABLE 16B

SITE-SPECIFIC REMEDIATION GOALS
PCBs and Metals
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Compound	Remediation Goal (milligrams per kilogram; mg/kg)	Explanation
PCBs[1] in Soil		
Aroclor-1254	4.4	Noncarcinogenic RBSL[2] for Construction Workers
Total PCBs (Aroclor-1232, Aroclor-1248, Aroclor-1254, and Aroclor-1260) *For soil that may be left exposed at the surface following redevelopment*	7.4	Derived from the Carcinogenic RBSL for Outdoor Industrial Workers (0.74 mg/kg). A total PCB concentration of 7.4 mg/kg is protective of cumulative industrial worker exposure to PCBs, based on a target cancer risk of 10^{-5}.
Total PCBs (Aroclor-1232, Aroclor-1248, Aroclor-1254, and Aroclor-1260) *For unexposed soil left below pavement or other protective ground cover following redevelopment*	76	Derived from the Carcinogenic RBSL for Construction Workers (7.6 mg/kg). A total PCB concentration of 76 mg/kg is protective of cumulative construction worker exposure to PCBs, based on a target cancer risk of 10^{-5}.
PCBs in Concrete		
Total PCBs (Aroclor-1232, Aroclor-1248, Aroclor-1254, and Aroclor-1260)	7.6	Carcinogenic RBSL for Construction Workers. A total PCB concentration of 7.6 mg/kg is protective of cumulative construction worker exposure to PCBs, based on a target cancer risk of 10^{-6}. Applying this remediation goal (versus a remediation goal based on a target cancer risk of 10^{-5}, 76 mg/kg) ensures that waste criteria for concrete containing PCBs is also met [i.e. less than 50 mg/kg, as defined in 40 CFR Section 761.61(a)(4)(i)(A)].
Metals in Soil		
Arsenic	10	Local Maximum Background Concentration in Soil, based on meeting with City of Vernon in April 2008.

Notes:
1. PCBs- Polychlorinated Biphenyls.
2. RBSL- Risk-Based Screening Level. Developed based on the methodology described in Appendix B, RBSLs were used to conduct the screening-level human health risk assessment (Section 4.0).

TABLE 16C

SITE-SPECIFIC REMEDIATION GOALS[1]
VOCs in Soil

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

depth (ft)	Concentration in micrograms per kilogram (µg/kg)				
	Trichloroethene	Tetrachloroethene	Benzene	Toluene	1,2-Dichloroethane
0	152	764	15	9,058	1.8
10	145	732	15	8,670	1.7
20	138	694	14	8,227	1.6
30	130	655	13	7,769	1.5
40	122	615	12	7,292	1.4
50	114	572	11	6,777	1.3
60	80	404	8	4,790	0.9
70	60	301	6	3,565	0.7
80	52	260	5	3,081	0.6
90	36	183	4	2,164	0.5
100	27	138	3	1,634	0.5
110	12	59	1	702	0.5
120	9	44	1	530	0.5
130	5	19	1	229	0.5
140	5	10	1	150	0.5
149	5	5	1	150	0.5

Notes:
1. Calculations based on Appendix A, "Attenuation Factor Method For VOCs" of "Remediation Guidance For Petroleum and VOC Impacted Sites" in Interim Site Assessment & Cleanup Guidebook published by the California Regional Water Quality Control Board, Los Angeles Region.

TABLE 17
SCREENING OF SOIL TECHNOLOGIES[1,2]
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
NO ACTION						
No Action	No further remedial action would take place at the Site. Retained for comparative purposes only.	All Shallow and Deep COC[3]-impacted soils	Poor. Does not meet RAOs[4]. Does not reduce mobility, toxicity, or volume of known wastes.	Good	Low. There are no costs associated with this alternative.	Retained- NCP[5] requirements [40 CFR[6] 300.430 (e)(6)].
INSTITUTIONAL CONTROLS						
Institutional controls (examples) - Deed covenants - Land use covenants - Groundwater use restriction - Zoning	Institutional controls are legal and administrative controls to prevent or control exposure to site occupants if residual contaminants remain on-site. These typically run with the land for perpetuity or as long as residual contamination exists.	All Shallow and Deep COC-impacted soils	Moderate	Moderate	Low	Not retained. Institutional Controls would most likely include either deed or land use covenants, and possibly long-term groundwater monitoring. Property owner input is necessary to make determinations regarding future Site use. Evaluation of groundwater is not included in this FS[7].
CONTAINMENT						
Capping	Creates a direct contact or migration barrier using a combination of soil/clay/concrete/ asphalt/geotextile liners to prevent direct contact with impacted soil or leaching to groundwater by infiltration. May also involve sub-slab venting beneath building foundations. Additional grading to ensure uniform surface for installation may be necessary. Both short-term construction and long-term quality assurance monitoring programs would be necessary. Could require future repairs or modifications to site redevelopment structures if found cap was breached.	All Shallow and Deep COC-impacted soils	Good	Poor. Does not meet the RAOs for the site. Does not reduce toxicity or volume through treatment of COCs.	Moderate	Not retained. Future site use not finalized. Any potential future capping requirements would be met by site redevelopment slabs and pavements.
Vapor Barrier	Creates a vapor migration barrier using a combination of low permeability materials including synthetic liners to protect from volatile vapor intrusion into buildings or other structures. May also involve passive or active sub-slab venting beneath building foundations. Both short-term construction and long-term quality assurance monitoring programs would be necessary. Requires additional site grading to ensure uniform application. Can be easily breached during any future site redevelopment. Not effective on inorganic or non-volatile organic compounds.	PCB[8]-impacted soils	Poor. Does not meet RAOs. Does not reduce mobility, toxicity, or volume through treatment. Does not reduce the magnitude of residual risk.	Moderate	Moderate. Expensive capitol and annual operations and maintenance costs.	Not retained due to low-volatility of PCBs.
		VOC[9]-impacted soils	Good	Moderate	Moderate. Expensive capitol and annual operations and maintenance costs.	Not retained for shallow- and deep-impacted soils. Any potential future vapor barrier requirements would be dictated by site reuse. Vapor barrier requirement may be negated by operation of an SVE[10] system.
		Metals-impacted soils	N/A[11]	N/A	N/A	Not applicable due to non-volatility of metals.

TABLE 17
SCREENING OF SOIL TECHNOLOGIES[1,2]
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
EX SITU TREATMENT						
Excavation/Removal	Excavation of impacted soils followed by treatment or disposal; excavated areas restored with clean backfill. Usually requires shoring at depths greater than 10 feet bgs. May require additional sloping of side walls. Excavation depth limited to size of excavator. Deeper excavations may require special equipment and engineering.	All Shallow and Deep COC-impacted soils	Good. Would meet RAOs for Site.	Moderate	Moderate	Retained. Excavation is a presumptive remedy for COC-impacted soil.
Onsite Low Temperature Thermal Desorption	Excavated soil is heated to thermally desorb COCs, which are then treated in the vapor phase. Treated soil can either be used as site backfill or disposed/recycled offsite. Not effective for inorganic compounds. Thermal desorption unit operation requires approximately 1/2 acre of available space for operation, excluding stockpile areas. Requires fuel source (propane or natural gas), installation of electrical power or use of portable electrical generators. Requires AQMD permit and fees to operate, and additional compliance monitoring costs. Excavation, stockpiling, and loading of COC-impacted soil necessary to feed unit. Temperatures typically not high enough to desorb and combust PCBs.	PCB-impacted soils	Poor. Temperatures not high enough to volatilize PCBs. Does not meet RAOs for the site. Does not reduce the toxicity, mobility, or volume through treatment.	Poor. Significant regulatory permitting issues and off-gas collection and treatment issues associated with thermal destruction of PCBs.	Moderate	Not retained.
		VOC-impacted soils	Moderate	Moderate	Moderate	Not retained for deeper VOC-impacted soils due to high relative costs when compared to in situ SVE. Also, not retained due to high permitting and operational costs.
		Metals-impacted soils	N/A	N/A	N/A	Not applicable for metals-impacted soil.
Incineration	Incineration uses controlled flame combustion to destroy COCs. Combustion of remaining VOCs and PCBs in secondary combustion chamber. Requires stringent off gas collection and treatment. High temperatures necessary to break down inorganic and non-volatile compounds. Incineration unit operational costs are high. Hazardous residual ash requires landfill disposal. Not feasible to perform on-site due to regulatory permitting requirements. Requires excavation and transportation to out-of-state facilities for incineration.	PCB-impacted soils	Moderate	Poor. Not technically feasible on-site based on regulatory approval challenges. Would require transportation of impacted material to out-of-state facility to implement off-site.	High. Expensive operations, maintenance and monitoring costs.	Not retained due to high costs.
		VOC-impacted soils	Moderate	Poor. Not technically feasible on-site based on regulatory approval challenges. Would require transportation of impacted material to out-of-state facility to implement off-site.	High. Expensive operations, maintenance and monitoring costs. Relatively more expensive than SVE technology	Not retained due to high costs.
		Metals-impacted soils	Poor. Does not meet RAOs for the site.	Poor. Not technically feasible on-site based on regulatory approval challenges. Would require transportation of impacted material to out-of-state facility to implement off-site.	High. Expensive operations, maintenance and monitoring costs.	Not retained due to high costs.

TABLE 17

SCREENING OF SOIL TECHNOLOGIES[1,2]

Former Pechiney Cast Plate, Inc., Facility

Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
Onsite Landfarming/ Bioremediation	Soil is spread in shallow lifts (6-inch to 1-foot thick) and treated by supplying air, moisture and nutrients needed to enhance bioremediation of COCs. Not effective on metals. Requires available space to thinspread soil. May require bottom liner, fugitive dust and emission controls, and run-on and run-off stormwater controls. Requires operations, maintenance, and monitoring.	PCB-impacted soils	Poor. Not a reliable or proven technology for PCBs. Does not meet RAOs for the site. Does not reduce the mobility, toxicity, or volume through treatment.	Moderate. Requires fugitive dust and emission controls, potential AQMD permitting requirements, and stormwater controls.	Moderate	Not retained; PCBs degrade very slowly aerobically and may require specially formulated admixtures to enhance degradation. Also not retained due to additional costs associated with necessary Site controls.
		VOC-impacted soils	Moderate	Moderate. Requires fugitive dust and emission controls, potential AQMD permitting requirements, and stormwater controls.	Moderate	Not retained due to additional costs associated with necessary Site controls.
		Metals-impacted soils	N/A	N/A	N/A	Not applicable; metals not biodegradable.
Offsite Treatment/Disposal - Landfill Disposal - Thermal Desorption - Stabilization	Excavated soil is loaded into trucks or containers for offsite transport for subsequent treatment or disposal. Offsite treatment/disposal includes thermal desorption, stabilization, and/or landfill disposal.	All Shallow and Deep COC-impacted soils	Good. Does meet RAOs for Site. One of the more common remedial technologies that has previously been broadly implemented.	Moderate. Would require off-site shipment of soil for landfill disposal.	Moderate	Retained. Landfill disposal is a commonly used technology for COC-impacted soils.
IN SITU TREATMENT						
Bioremediation	Intrinsic or enhanced bioremediation. Intrinsic bioremediation includes degradation of organic contaminants by naturally occurring microbes in the subsurface; other attenuation processes such as volatilization also occur. Enhanced bioremediation may include the addition of oxygen, biological agents, or nutrients to assist in degrading contaminants in soil. Requires subsurface injection or delivery gallery, and maintenance and monitoring. Requires a well characterized site; implementation requires long-term operations and monitoring. May require multiple applications of nutrients over a long term period necessary for complete remediation of COC-impacted soils.	PCB-impacted soils	Poor. Not an effectively demonstrated technology for PCBs. Does not meet RAOs for the site. Does not reduce the mobility, toxicity, or volume through treatment.	Poor. Not a broadly implemented technology for PCBs.	Moderate	Not retained; PCBs degrade very slowly and may require specially formulated admixtures to enhance degradation. Also not retained due to nutrient delivery constraints, high maintenance and monitoring costs, and need for multiple applications over a long term.
		VOC-impacted soils	Moderate. Not as effective as SVE for VOC constituents. Effectiveness limited to success of nutrient delivery system. Requires long-term maintenance and monitoring.	Moderate	Moderate	Not retained due to nutrient delivery constraints, high maintenance and monitoring costs, and need for multiple applications over a long term.
		Metals-impacted soils	N/A	N/A	N/A	Not applicable. Metals are not biodegradable.
Soil Vapor Extraction	Volatile vapors removed from soil with slotted piping and a vacuum blower; extracted vapors treated aboveground with activated carbon or thermal oxidizer. This technology is usually implemented to remove VOCs in shallow or deep soils and is effective in moderate to highly permeable soils. Requires the installation of a soil vapor extraction well network, electrical power, AQMD[12] permit, and operations and maintenance. Not effective on inorganic or non-volatile compounds. Usually implemented in moderate to large areas of impacted soils.	PCB-impacted soils	Poor. Not an effective technology for PCB-impacted soils. Does not meet RAOs for the site. Does not reduce the mobility, toxicity, or volume through treatment.	Moderate	Moderate	Not retained due to the non-volatility of PCBs.
		VOC-impacted soils	Good	Good	Moderate	Retained for shallow and deep impacted soils. SVE is a presumptive remedy for VOC-impacted soils.

TABLE 17
SCREENING OF SOIL TECHNOLOGIES[1,2]
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
Soil Vapor Extraction (continued)		Metals-impacted soils	N/A	N/A	N/A	Not applicable due to non-volatility of metals.
In situ Thermal Desorption (Thermal conduction heating)	Heating subsurface soil using thermal wells via resistive heating elements with associated vapor extraction to remove volatilized contaminants. Soil is heated by thermal conduction, and no current flows through soil. Extracted vapors are treated aboveground with activated carbon or a thermal oxidizer. Demonstrated high costs associated with installation and operation of the thermal heating elements. Requires AQMD permit to operate and long-term operations, maintenance, and permit compliance monitoring.	PCB-impacted soils	Poor. Does not meet RAOs for the site. Does not reduce the mobility, toxicity, or volume through treatment.	Moderate	High	Not retained due to low volatility of PCBs and high costs of implementation and operation of the system.
		VOC-impacted soils	Moderate	Moderate	High	Not retained due to high costs of implementation and operation of the system relative to SVE technologies.
		Metals-impacted soils	N/A	N/A	N/A	Not applicable due to non-volatility of metals.
Stabilization	In situ stabilization involves mixing contaminated soils with inorganic binders such as cement or pozzolans to bind or encapsulate soils. Effectiveness diminishes with higher concentration oily wastes. Requires implementation and mobilization of a stabilization material delivery unit. On-site pilot tests are necessary to estimate delivery quantity of stabilization material. Not effective on volatile compounds.	PCB-impacted soils	Good. Previously demonstrated effective on sites with lower concentrations of PCBs in soil.	Moderate. Would require bench scale mix design.	Moderate	Retained
		VOC-impacted soils	Poor. Will require collection and treatment of VOC vapors generated during stabilization activities.	Moderate	Moderate	Not retained; poor effectiveness on VOCs. High volatility compounds would generate excessive odors during implementation.
		Metals-impacted soils	Good. Stabilization is a commonly applied technology for metals-impacted soils.	Moderate	Moderate	Retained

Notes:

1. Definitions of Criteria:
   -Effectiveness is ability of the remedial technology to achieve remedial action objectives;
   -Implementability is a measure of the technical and administrative feasibility of constructing, operating and maintaining a remedial alternative; and,
   -Cost refers to a relative cost compared with other technologies in same technology type. Costs will be refined later in the FS process.
2. Table uses a relative rating scheme: Good, Moderate, Poor for effectiveness and implementability criteria; High, Moderate, and Low for cost criteria.
3. COC = Chemical of Concern.
4. RAOs = Remedial Action Objectives.
5. NCP = National Contingency Plan.
6. CFR = Code of Federal Regulations.
7. FS = Feasibility Study.
8. PCB = Polychlorinated Biphenyls.
9. VOC = Volatile Organic Compounds.
10. SVE = Soil Vapor Extraction.
11. N/A = Not Applicable.
12. AQMD = Air Quality Management District.

TABLE 18

SCREENING OF PCB-IMPACTED CONCRETE TECHNOLOGIES[1,2]

Former Pechiney Cast Plate, Inc., Facility

Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
NO ACTION						
No Action	No further remedial action would take place at the site. Retained for comparative purposes only.	PCB[3]-impacted concrete	Poor. Does not meet RAOs[4]. Does not reduce mobility, toxicity, or volume of known wastes.	Good	Low. There are no costs associated with this alternative.	Retained- NCP[5] requirements [40 CFR[6] 300.430 (e)(6)].
INSTITUTIONAL CONTROLS						
Institutional controls (examples) - Deed covenants - Land use covenants - Zoning	Institutional controls are legal and administrative controls to prevent or control exposure to site occupants if residual COCs remain on-site. These typically run with the land for perpetuity or as long as residual contamination exists.	PCB-impacted concrete	Moderate	Moderate	Low	Not retained. Institutional Controls would most likely include either deed or land use covenants. Property owner input is necessary to make determinations regarding future Site use.
EX SITU TREATMENT						
Demolition/Disposal	Demolition of PCB-impacted concrete followed by offsite disposal. Demolition involves the use of heavy equipment. Concrete is sawcut and removed or demolished using a hydraulic breaker. Requires dust and noise controls. Offsite disposal requires sizing of concrete, stockpiling, and loading into transport trucks. Available space is needed onsite for stockpiling. Concrete with concentrations less than remediation goals would be recycled and used as backfill material onsite. Concrete with concentrations greater than remediation goals would be transported offsite and disposed of in an appropriate landfill.	PCB-impacted concrete	Good. Would meet RAOs.	Good	Moderate	Retained
IN SITU TREATMENT						
Scarification	Impacted concrete is removed in thin layers using a grinder. Creates a fine dusty material. Requires use of heavy equipment with grinder attachments. Dust and noise controls are necessary to protect workplace. Impacted concrete must be well defined in area of application. Scarification is a slow process and large areas require a long period of time to complete.	PCB-impacted concrete	Poor. Not cost effective on multi-layered surfaces that would require demolition and removal of overlying concrete after scarification of surface, to provide access to lower impacted layers for additional scarification.	Moderate. Impacted concrete dust will require collection and disposal.	Moderate	Not retained due to lack of effectiveness and dust collection issues.

TABLE 18
SCREENING OF PCB-IMPACTED CONCRETE TECHNOLOGIES[1,2]
Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Technology Type	Description	Remediation Scenario	Effectiveness	Implementability	Cost	Screening Comments
Encapsulation	Encapsulation or sealing of impacted concrete slab areas involves physically microencapsulating wastes by sealing them with an applied compound. Encapsulation is typically performed with polymers, resins or other proprietary binding and sealing compounds that are bonded to the impacted surface. Would require periodic inspection and maintenance to maintain integrity of sealed areas.	PCB-impacted concrete	Poor. Surface encapsulation effectiveness is limited to the adhesion between coating and bound wastes. Long-term integrity has not been effectively demonstrated on other sites. Selected bonding agent would need to be resistant to ultraviolet radiation, or another protective coating would be required to protect sealed areas.	Moderate. Requires the impacted surface to be free of dust or other materials that might affect bonding capability of sealant.	High	Not retained. Encapsulation would require the slab areas to be left in place. This would not allow demolition of existing below grade foundations and footings that are being removed as a component of the Site cleanup. Encapsulation would likely require TSCA[7]-related deed covenants or land use restrictions. Property owner input is necessary to make determinations regarding future Site use.
Steam Cleaning/ Pressure Washing	High pressure and/or hot water is applied to impacted concrete surfaces to remove contaminants. Not effective on multiple layered surfaces. Does not remove heavily-stained or oil impregnated impacts on porous concrete.	PCB-impacted concrete	Poor. Existing surface slabs were steam cleaned during above grade demolition work associated with building and floor cleaning; subsequent concrete coring indicated PCB-impacts above screening criteria were still present at the surface.	Moderate. Requires collection and disposal of impacted washing rinsate.	High. Not cost effective on multi-layered surfaces that would require demolition and removal of overlying concrete to provide access to lower impacted layers for additional steam cleaning.	Not retained due to lack of effectiveness.

Notes:
1. Definitions of Criteria:
 -Effectiveness is ability of the remedial technology to achieve remedial action objectives;
 -Implementability is a measure of the technical and administrative feasibility of constructing, operating and maintaining a remedial alternative; and,
 -Cost refers to a relative cost compared with other technologies in same technology type. Costs will be refined later in the FS process.
2. Table uses a relative rating scheme: Good, Moderate, Poor for effectiveness and implementability criteria; high, moderate, and low for cost criteria.
3. PCB - Polychlorinated Biphenyls.
4. RAOs = Remedial Action Objectives.
5. NCP = National Contingency Plan.
6. CFR = Code of Federal Regulations.
7. TSCA= Toxic Substances Control Act deed covenants [40 CFR 761.61(a)(8)]

TABLE 19

EVALUATION OF REMEDIAL ALTERNATIVES

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Remedial Alternative Description [40 CFR 300.430 (d)(1)][1]	Overall Protection of Human Health and Environment [40 CFR 300.430 (e)(9)(iii)(A)]	Compliance with ARARs[2] [40 CFR 300.430 (e)(9)(iii)(B)]	Long-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(C)]	Reduction of Mobility, Toxicity, and Volume by Treatment [40 CFR 300.430 (e)(9)(iii)(D)]	Short-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(E)]	Implementability [40 CFR 300.430 (e)(9)(iii)(F)]	State Support/Agency Acceptance [40 CFR 300.430 (e)(9)(iii)(H)]	Community Acceptance [40 CFR 300.430 (e)(9)(iii)(I)]	Capital Cost [40 CFR 300.430 (e)(9)(iii)(G)(1)]	O&M[3] Cost for 3 years [40 CFR 300.430 (e)(9)(iii)(G)(2)]	Total Cost NPV[4] 3 years [40 CFR 300.430 (e)(9)(iii)(G)(3)]
Alternative 1: No Action [40 CFR 300.430 (e)(6)]									**$0**	**$0**	**$0**
No further action required.	Would not meet RAOs[5] for the Site.	No activities proposed that would trigger action-specific ARARs.	RAOs not achieved.	Limited reduction in mobility, toxicity, or volume.	RAOs not achieved.	No additional effort required.	Not Acceptable.	Not Acceptable.			
Alternative 2: Excavation and Disposal of All COC[6]-Impacted Soil + Demolition and Disposal of PCB[7]-Impacted Concrete									**$18,200,000**	**$0**	**$18,200,000**
1) Soil Excavation and Off-Site Disposal.	Would meet RAOs of mitigating shallow COC-impacted soils above the risk-based remediation goals summarized in Table 15. Excavation poses no overall element of risk to human health or the environment.	Would comply with requirements established by the City of Vernon H&EC[8].	Would prevent potential human exposure by eliminating pathways between future receptors and soil, soil vapor, and airborne dusts. Evaluated using CERCLA[9] guidelines (US EPA, 1988, section 6.2.3.3)[10].	Would reduce the volume of COCs in soil. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Risk to receptors and the environment is low if appropriate PPE[11] is worn by workers and dust, noise and odor controls are implemented. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Technology is reliable and effective. Impacted areas would need to be well defined, but implementation relatively straightforward using commercially available equipment. Shoring or other stability measures are required. Necessary permits must be obtained. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			
2) Concrete Demolition and Off-Site Disposal.	Would meet RAOs to mitigate PCBs above the risk-based remediation goals established for future site use of concrete. These goals are summarized in Table 15.	Does not comply with impacted concrete reuse requirements proposed by the City of Vernon H&EC.	Would prevent potential human exposure by eliminating pathways between potential receptors and recycled concrete and airborne concrete dust. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce the volume of PCBs in concrete. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise and odor controls are implemented. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Impacted areas would need to be well defined, but implementation relatively straightforward using commercially available equipment. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			

TABLE 19

EVALUATION OF REMEDIAL ALTERNATIVES

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Remedial Alternative Description [40 CFR 300.430 (d)(1)][1]	Overall Protection of Human Health and Environment [40 CFR 300.430 (e)(9)(iii)(A)]	Compliance with ARARs[2] [40 CFR 300.430 (e)(9)(iii)(B)]	Long-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(C)]	Reduction of Mobility, Toxicity, and Volume by Treatment [40 CFR 300.430 (e)(9)(iii)(D)]	Short-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(E)]	Implementability [40 CFR 300.430 (e)(9)(iii)(F)]	State Support/Agency Acceptance [40 CFR 300.430 (e)(9)(iii)(H)]	Community Acceptance [40 CFR 300.430 (e)(9)(iii)(I)]	Capital Cost [40 CFR 300.430 (e)(9)(iii)(G)(1)]	O&M[3] Cost for 3 years [40 CFR 300.430 (e)(9)(iii)(G)(2)]	Total Cost NPV[4] 3 years [40 CFR 300.430 (e)(9)(iii)(G)(3)]
Alternative 3: Excavation and Disposal of Shallow COC-Impacted Soil + Soil Vapor Extraction for Shallow and Deep VOC-Impacted Soil + Demolition and Disposal of PCB-Impacted Concrete									**$1,400,000**	**$1,100,000**	**$2,500,000**
1) Soil Excavation and Off-Site Disposal.	Would meet RAOs of mitigating shallow COC-impacted soils above the risk-based remediation goals summarized in Table 13 and pose no overall element of risk to human health or the environment.	Would comply with requirements established by the City of Vernon H&EC.	Would prevent potential human exposure by eliminating pathways between future receptors and soil, soil vapor, and airborne dusts. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce the volume of COCs in soil. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise and odor controls are implemented. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Technology is reliable and effective. Impacted areas would need to be well defined, but implementation relatively straightforward using commercially available equipment. Shoring or other stability measures are required. Necessary permits must be obtained. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H & EC.	Will be evaluated during public participation process.			
2) Soil Vapor Extraction.	Would meet RAOs of mitigating deeper soils impacted with COCs for protection of groundwater and poses no overall element of risk to human health or the environment.	Would comply with requirements established by the City of Vernon H&EC.	SVE is a presumptive remedy and can achieve site-specific remediaiton goals for VOC-impacted soils. Would prevent potential human exposure by eliminating pathways between future receptors and soil and soil vapors. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce mobility of VOCs in subsurface, and reduce mass of VOCs and Stoddard Solvents in soil. Evaluated using CERCLA guidelines(US EPA, 1988, section 6.2.3.4).	Poses low risk to receptors and the environment if appropriate PPE is worn by workers and noise and odor controls are established during implementation. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Implementation requires well defined impacted areas with an effective monitoring program of the SVE system. Technology is reliable and effective. Necessary permits must be obtained for operation. Evaluated using CERCLA guidelines(US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			
3) Concrete Demolition and Off-Site Disposal.	Would meet RAOs to mitigate PCBs above the risk-based remediation goals established for future site use of concrete. These goals are summarized in Table 13.	Does not comply with requirements established by the City of Vernon H&EC.	Would prevent potential human exposure by eliminating pathways between potential receptors and recycled concrete and airborne concrete dust. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce the volume of PCBs in concrete. Evaluated using CERCLA guidelines(US EPA, 1988, section 6.2.3.4).	Appropriate PPE would be worn by workers and dust, noise and odor controls would be established during implementation. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Impacted areas would need to be well defined, but implementation relatively straightforward using commercially available equipment. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H & EC.	Will be evaluated during public participation process.			

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EVALUATION OF REMEDIAL ALTERNATIVES

Former Pechiney Cast Plate, Inc., Facility
Vernon, California

Remedial Alternative Description [40 CFR 300.430 (d)(1)][1]	Overall Protection of Human Health and Environment [40 CFR 300.430 (e)(9)(iii)(A)]	Compliance with ARARs[2] [40 CFR 300.430 (e)(9)(iii)(B)]	Long-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(C)]	Reduction of Mobility, Toxicity, and Volume by Treatment [40 CFR 300.430 (e)(9)(iii)(D)]	Short-Term Effectiveness [40 CFR 300.430 (e)(9)(iii)(E)]	Implementability [40 CFR 300.430 (e)(9)(iii)(F)]	State Support/Agency Acceptance [40 CFR 300.430 (e)(9)(iii)(H)]	Community Acceptance [40 CFR 300.430 (e)(9)(iii)(I)]	Capital Cost [40 CFR 300.430 (e)(9)(iii)(G)(1)]	O&M[3] Cost for 3 years [40 CFR 300.430 (e)(9)(iii)(G)(2)]	Total Cost NPV[4] 3 years [40 CFR 300.430 (e)(9)(iii)(G)(3)]
Alternative 4: In Situ Stabilization of Shallow PCB/Metals-Impacted Soil + Soil Vapor Extraction for Shallow and Deep VOC-Impacted Soil + Demolition and Disposal PCB-Impacted Concrete									**$1,700,000**	**$1,100,000**	**$2,800,000**
1) Soil Stabilization.	Would not meet RAO of mitigating shallow COC-impacted soils above the risk-based remediation goals summarized in Table 15. Poses no overall element of risk to human health or the environment. Would meet RAO of mitigating soils impacted with COCs for protection of groundwater.	Would comply with requirements established by the City of Vernon H&EC.	Would prevent potential human exposure by eliminating pathways between future receptors and soil, soil vapor, and airborne dusts. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce the mobility and possibly toxicity of COCs in soil. No reduction in volume. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Risk to receptors and the environment is low if appropriate PPE is worn by workers and dust, noise and odor controls are implemented. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Requires a bench-scale test and a well defined impacted area. Implementation relatively straightforward using large diameter auger drilling rig. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			
2) Soil Vapor Extraction.	Would meet RAOs of mitigating deeper soils impacted with COCs for protection of groundwater and poses no overall element of risk to human health or the environment.	Would comply with requirements established by the City of Vernon H&EC.	SVE is a presumptive remedy and can achieve site-specific remediation goals for VOC-impacted soils. Would prevent potential human exposure by eliminating pathways between future receptors and soil and soil vapors. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce mobility of VOCs in subsurface, and reduce mass of VOCs and Stoddard Solvents in soil. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Poses low risk to receptors and the environment if appropriate PPE is worn by workers and noise and odor controls are established during implementation. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Implementation requires well defined impacted areas with an effective monitoring program of the SVE system. Technology is reliable and effective. Necessary permits must be obtained for operation. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			
3) Concrete Demolition and Off-Site Disposal.	Would meet RAOs to mitigate PCBs above the risk-based remediation goals established for future site use of concrete. These goals are summarized in Table 15.	Does not comply with impacted concrete reuse requirements proposed by the City of Vernon H&EC.	Would prevent potential human exposure by eliminating pathways between potential receptors and recycled concrete and airborne concrete dust. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.3).	Would reduce the volume of PCBs in concrete. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.4).	Appropriate PPE would be worn by workers and dust, noise and odor controls would be established during implementation. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.5).	Impacted areas would need to be well defined, but implementation relatively straightforward using commercially available equipment. Evaluated using CERCLA guidelines (US EPA, 1988, section 6.2.3.6).	Will be evaluated after draft report has been presented to City of Vernon H&EC.	Will be evaluated during public participation process.			

Notes:
1. National Contingency Plan Code of Federal Regulations Guidance.
2. Applicable or relevant and appropriate requirements (ARARs).
3. O&M = Operations And Maintenance.
4. NPV = Net Present Value.
5. RAO = Remedial Action Objective.
6. COC = Chemical of Concern.
7. PCB = Polychlorinated Biphenyls.
8. CERCLA = Comprehensive Environmental Response, Compensation and Liability Act.
9. H&EC = Health and Environmental Compliance.
10. United States Environmental Protection Agency (US EPA), Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA, 1988.
11. PPE = Personal Protective Equipment.